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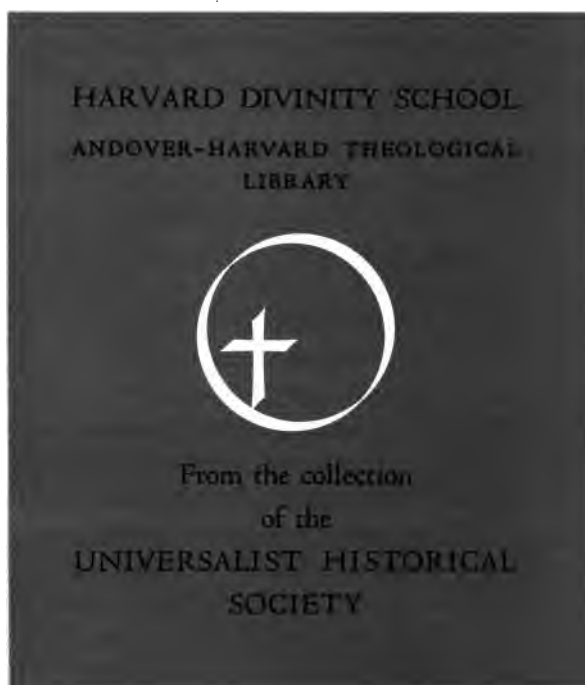
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GOD'S WONDER WORLD

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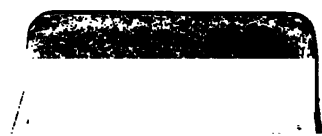
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**THE BEACON PRESS PUBLICATIONS
IN RELIGIOUS EDUCATION**

**THE BEACON COURSE
OF GRADED LESSONS**

**William I. Lawrance
Florence Buck**

EDITORS.



GOD'S WONDER WORLD

*I would seek unto God, . . .
Who doeth great things and unsearchable,
Marvellous things without number.*

JOB 5:8, 9



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GOD'S WONDER WORLD

*A Manual
for Religious Instruction
in Junior Grades*

ESPECIALLY FOR PUPILS
NINE YEARS OLD

BY
CORA STANWOOD COBB, A.B.



THE BEACON PRESS

25 BEACON STREET
BOSTON, MASS.

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THE UNIVERSITY PRESS, CAMBRIDGE, U. S. A.

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TO MY FATHER

DARIUS COBB

WHOSE DEEP LOVE OF NATURE AND
APPRECIATION OF ITS BEAUTY AND
GRANDEUR IS THE WELL FROM WHICH
I HAVE DRUNK FROM MY EARLIEST
CHILDHOOD

Editors' Preface

THE Beacon Course in Religious Education, to which this book belongs, provides a manual for each year for pupils from four to twenty-one years of age. Its purpose throughout is to guide those who use it into noble and serviceable manhood and womanhood. This it aims to do by acquainting them with the religious aspects of nature and of social relations, quickening in them at the same time an earnest desire to serve their day and generation. In such a training, knowledge of the world in which we live, its origin and its laws, is of evident importance.

A study of nature seems peculiarly fitting to pupils entering upon the Junior period. They have come to that stage in their development when imagination begins to give place to observation, and desire is quickened to know the world as it actually is. That world they will in some fashion come to know. It is the privilege and therefore the obligation of the teachers of religion to see that the first impressions children get of the marvelous world in which they live are religious impressions, and that the habit of associating things seen and physical with things unseen and spiritual is formed early in life.

The book here offered is intended for use with pupils nine years of age. It can be used with those

EDITORS' PREFACE

somewhat older, and students of whatever age will find it instructive and suggestive. Whoever delights, with Kepler, to "read God's thoughts after Him" discovers in a reverent study of nature food for mind and spirit. In the pursuit of the infinite and eternal forces and processes, differences of a few years cease to be of importance, and the student finds himself, in Higginson's fine phrase, of the age of everybody. If this book helps our children to enter into the treasures of the world, to see everywhere in earth and sky reminders of divine power and love, and to tread the earth habitually with reverent feet, the purpose for which it has been prepared, as of the Course of which it is a part, will have been accomplished.

THE EDITORS.

Author's Preface

REGARDING the education of the young, Huxley strongly advised that children of the ages of nine and ten should be instructed in the infinite wonder and majesty of the works of God, and that the instruction should be given upon Sunday, side by side with the lessons from the Bible.

The author has attempted to follow out the plan advocated by Huxley, and she offers this book with the earnest hope that these stories will "awaken the minds of the young to the infinite wonder and majesty of the works which are proclaimed His, and teach them those laws which must needs be His laws and therefore of all things most needful for man to know."¹

The children who begin their observation of nature in this way may well be among those who will take honors in Nature's university; for according to Huxley's belief, "those who take honors in Nature's university, who learn the laws which govern men and things and obey them, are the really great and successful men in the world."¹

Great men and women are what the world is calling for, but before the man or woman can become great the child must have been started upon the right road.

¹ *Lay Sermons, Addresses, and Reviews*, 1871.

AUTHOR'S PREFACE

The author wishes to express her thanks to Miss Alice M. Barton, an experienced teacher of nature studies in the Boston public schools, for reading the completed manuscript and making valuable suggestions. Thanks are due to Enos A. Mills, Dr. A. Howard Clark, W. A. Bentley, Prof. Alexander McAdie and the Blue Hill Observatory, Mrs. C. H. McL. Burns, Rev. Joel H. Metcalf, Prof. E. S. Dana and John Wiley and Sons, Inc., publishers of his book; to the American Museum of Natural History, United States Geological Survey, and many others who have lent the photographs which are used in the leaflets which accompany this volume; and to the Comstock Publishing Company, Raymond and Whitcomb Company and Ginn and Company for the use of cuts.

CORA STANWOOD COBB.

NEWTON UPPER FALLS, MASS.

August, 1918

CONTENTS

	PAGE
PURPOSE AND PLAN OF THE COURSE	xi
SUGGESTIONS TO THE TEACHER	xiv
THE CHILD OF NINE	xvi
THE MEMORY WORK	xix
BOOKS FOR THE TEACHER	xxi

PART I

THE WORLD IN WHICH WE LIVE

LESSON		
I	BEAUTY IN GOD'S WORLD: The Clouds	3
II	EARTH'S GARMENT OF GREEN	10
III	THE BLOSSOMING PLANTS	18
IV	PLANTS SOWING THEIR SEEDS	26
V	THE TREES	34
VI	HOW PLANTS LIVE TOGETHER	42
VII	THE EARTH OUR STOREHOUSE	51

PART II

ANIMALS AND INSECTS

VIII	THE ANTS	61
IX	THE SPIDER	70
X	THE BEES	78
XI	MOTHS AND BUTTERFLIES	87
XII	TOADS, BATS AND OWLS	97
XIII	HUMBLE HELPERS	106
XIV	THE BIRDS	114
XV	ANIMAL FRIENDS	122
XVI	THE DOG	131
XVII	BEAVERS	140

PART III

THE EARTH MADE READY FOR MAN

LESSON		PAGE
XVIII	AS IT WAS IN THE BEGINNING . . .	151
XIX	THE WORK OF THE RAIN	158
XX	THE WORK OF THE RAIN: Brooks and Rivers	166
XXI	SNOW, ICE AND FROST	174
XXII	MINERALS AND CRYSTALS	182
XXIII	EARTH'S UNDERGROUND STOREHOUSE	191
XXIV	GOD'S WONDERFUL MOUNTAINS . . .	199
XXV	LIFE COMES UPON THE WORLD . . .	207
XXVI	FOSSILS	214
XXVII	HOW OUR COAL WAS MADE	222
XXVIII	MORE WONDERS FROM NATURE'S BOOK	231
XXIX	THE STORY THAT A SCRATCHED ROCK TELLS	239

PART IV

THE COMING OF MAN

XXX	MAN COMES UPON THE EARTH . . .	249
XXXI	MAN'S PROGRESS: The Working Hands and Thinking Mind	257
XXXII	MAN'S PROGRESS: Growth in Religion	265
XXXIII	MAN'S PROGRESS: The Written Word	273
XXXIV	THE STORY OF STEAM	281
XXXV	THE STORY OF ELECTRICITY	288
XXXVI	SEARCHERS AFTER NATURE'S TRUTHS	297
XXXVII	GOD'S GIFT OF SUNLIGHT	306
XXXVIII	THE SOLAR SYSTEM	314
XXXIX	THE STARS	322
XL	THE TORCH BEARERS	330

Introduction

Purpose and Plan of the Course

THE aim in preparing this course of lessons has been to make a direct appeal to those faculties of perception, curiosity, and wonder which are beginning to assert themselves in the child of nine; to foster these faculties, already active in some children, and to arouse them in others; to open their eyes to some of the marvels of the universe; to impress their minds with the idea of its law and order; and to arouse in their hearts a response to the divine love manifested in the world in which we live.

“Wherever it may look, the young mind is impressed with the mystery of the unknown. The child looks out to Nature with great eyes of wonder.”¹ It is this wonder which directs the growing intelligence of the child. It gives the perception something to work upon, and the reason something to do. It urges attention and interest on to what is unknown.

• These lessons, therefore, have been arranged in such a way as to proceed from what the child has already perceived to what he must look for. Accordingly, Part I deals with the trees, plants and flowers that every child has seen and knows; Part II, with insect and animal life, of which the child has known

¹ *The Nature-Study Idea.* By L. H. Bailey.

in a vague way, but which through study he will now learn to observe more carefully; Part III, with the — to him — unknown wonders of Geology; and Part IV, with the history of mankind, in a series of stories which should open his eyes to the vast possibilities in the life of each individual and in the life of the race. In this last section of the book, which describes man's first appearance upon the earth and follows his material progress as well as his mental and spiritual growth, the lessons in Astronomy are included, because the knowledge of that science shows, perhaps more than any of the others, the growth and power of man's mind.

The lessons in Parts I and II are designed not alone to teach children some important facts, but to show them those facts in such a way as to win respect for the forms of life which all human beings, children as well as older people, are accustomed to think of as beneath them. Whatever the child learns to look upon with affectionate interest he will treat with respect. Trees, plants and flowers, as well as insects and animals, will not only receive protection from him but, quite unconsciously perhaps, he will take them into his daily life as friends. This friendly feeling for nature in her different aspects will broaden and deepen his whole being and help him to become one with God in spirit.

The story of the formation of the earth and of the coming of life as told in Part III may yield a lifetime of happiness and of religious faith to the student. He will learn with amazement that such familiar forces as the rain and the frost have been used to build the

majestic mountains and to fit the globe for life. Attention to the most ordinary features of his surroundings should make the child reverent toward the earth on which he lives, and lead him to worship the Power and Love that formed it.

Part IV deals with the broader moral questions of the duties which all those of the human race, gifted above God's other creatures, owe to themselves, the world and their Maker. It is intended to point out to the children the slow steps by which the race of mankind has moved onward, to impress upon them, also, the fact that increase in physical comfort does not mean race advancement, unless there goes with it a corresponding progress in mental and spiritual life.

Children of nine or ten are not too young to learn something of the value of life, and to understand how much the thought of one person can help the whole race of mankind, and so God's world.

The subjects treated in this book are so vast and comprehensive that they can merely be touched upon. Only a series of pictures, as it were, can be shown the children; but it is hoped that the pictures are vivid enough to awaken their interest and wonder and to encourage them in the use of their own "seeing eyes."

If one child should be led by these lessons to use his eyes and mind in such a way as to become a world-helper, the study and love of a lifetime which have gone to make this book will not have been in vain.

Suggestions for the Teacher

As the stories which form these lessons deal with scientific facts, where accuracy is essential, the teacher is advised to read them to the class. But it is important to prepare for the reading as earnestly as if the story were to be told in the teacher's own language. The word pictures which the stories contain should be given in as vivid a manner as possible, that they may call up in the mind of the child a correspondingly vivid picture. It is by these mental images that interest will best be aroused.

The questions in the lesson story should be asked as spontaneously as if they had just occurred to the teacher. Where they relate to some familiar fact, answers may be secured from the class before proceeding with the reading if desired. Sometimes the purpose of a question is to focus attention on the new fact or truth which is to be stated, to which the reading should proceed without pause, so that the teacher answers the question in the words of the lesson story.

It would be well before attempting to teach any of these lessons, to read all the stories in this manual so as to be cognizant of its scope. One should at least be familiar with all the stories in each part before attempting to teach the first lesson in that part. Especially is this true of the section that deals with Geology (Lessons 18 to 29); for the teacher who has not grasped the picture of the changing world as a whole cannot well teach it in part.

Many of the illustrations in Part I are drawn from

the plants and trees of New England; but in localities where these are not found teachers will substitute others which will fit into the lesson story.

In connection with the lessons in Part III the teacher should become acquainted with the native rock of the locality, and any interesting geological feature to be observed. Whatever the country rock is — conglomerate, sandstone, slate, limestone, marble, granite, gneiss, schist — it should be shown to the children and they should be taught to know it. Where measurements are given, refer for comparison to some object or distance well known to the pupils.

It is intended that the memory verse should be read to the class at the beginning of the lesson and learned at the close. The pupils will also have it in the leaflet for constant reference.

The handwork will usually be done at home during the week, but should always be asked for and examined at the beginning of each Sunday's lesson, and referred to from time to time.

Making collections is a fundamental instinct with children of this age, and is a most important help in the development of their minds. William James says that children form a kinship with the world through handling and arranging what they have thus gathered. Therefore the teacher should encourage them to make the suggested collections and should show decided interest in the results.

After the teacher has examined the work done by the pupils during the week, either by questions about their collections and observation, or by examination

of their work on the leaflet, it is well to review briefly the lesson of the preceding Sunday. Some of the questions furnished are intended to be a guide in this review. Any method of review which seems advisable to the teacher should be used, making sure that the children have a correct idea of those subjects which the questions cover.

Throughout this whole course of lessons the teacher should work to stimulate curiosity and wonder in the children of the class, and to arouse such eager interest in the natural objects about them that the perceptive faculties will be quickened. Thus the children will gain the ability to look at nature with "seeing eyes," and a deep moral and religious feeling toward God's wonder world will develop of itself in their hearts and minds.

The Child of Nine

As the child nears the age of nine, the vivid imagination which seemed to dominate his mind during the preceding years begins to give way to a more active interest in what is going on around him. The world of fact, which has been more or less obscured by his own fancy, has gradually become more apparent to his growing intelligence. His curiosity is aroused as he looks with questioning wonder upon those very things that, but recently, furnished his imagination with fanciful stories. His eyes are opened to the reality of the world in which he lives, and his mind is full of questions concerning the why and wherefore of every thing he sees, — questions which are some-

times asked outright, but are often revolved over and over before they are given voice.

The child is learning to think. The interest, curiosity and wonder that gradually supersede the imagination are a part of that thought growth which leads to reason. In his limited way the child reasons about whatever excites his wonder. Those objects that had existed for him before in a world of fancy belong now to the real world in which he lives.

Moreover, the child at this age must know the truth. He is not content to be put off with a hasty answer that does not satisfy his mind. Indeed, many children of nine have developed a reasoning power not suspected by their elders, because children so young have not yet learned to express their thoughts clearly.

The growing minds of these children should be most carefully fostered. This may be accomplished not only by interested and truthful answers to their questions, but by so guiding their newly awakened faculty of perception that they will observe correctly those things which have awakened their interest.

In no other way can this be accomplished with so much lasting benefit to the child as by the study of nature. The natural objects which he sees on his way to and from school, if carefully observed, will furnish a legitimate field for his newly developed faculties of observation, curiosity and wonder. The training thus given to the powers of observation will often turn an apparently dull child into a bright and alert boy or girl.

Nine, then, is a crucial age, when the dawning wonder of the child's newly awakened curiosity can be so fostered through the close observation of nature as to affect his whole after life and, possibly, the life of mankind.

The Memory Work

VERSES from the Bible or lines of poetry, or both, are printed on each leaflet. Three hymns are given entire, one of them being printed, a verse at a time, on three consecutive leaflets, 37-39. The teacher might well secure as a minimum of memory work for the year, the following:

Ten of the verses from the Bible.

One continuous Bible passage of from six to ten verses from the Psalms, or the book of Job, or the sayings of Jesus.

One of the three hymns, preferably "I sing the mighty power of God," as it seems to fit the thought of the entire course of lessons.

The teacher will wish to be familiar with the great Bible creation stories and hymns, Gen. 1:1 to 2:3; Job 26:7-14; Psalms 65:6-13, and 104 entire; the sublime statement of the revelation of God through nature in Job 36:24-33 and chapters 28, 37 and 38 entire; and numerous verses and passages in the Psalms, such as 19:1-6 and 96:11-13. A number of the memory verses have been taken from the chapters here cited.

Readings from the New Testament have occasionally been suggested to the pupil, in connection with the lessons. The teacher may help these children to see, as they read the nature parables Jesus told and learn about the places he frequented, that the story of his life is, as *Fishin' Jimmy* discovered, "an

out-door gospel all through.”¹ The leading nature parables and references are here given: —

The Sower. Matt. 13:1-9.

The Wheat and the Tares. Matt. 13:24-30.

The Good Tree and its Fruit. Matt. 7:16-20; Luke 6:43-45.

The Fig Tree. Luke 13:6-9.

The Weather. Matt. 16:1-3; Luke 12:54-57.

The Harvest. Matt. 9:37-38; Luke 10:2.

The Mustard Seed. Matt. 13:31-32; Luke 13:18.

The Lost Sheep. Matt. 18:12-14; Luke 15:3-7.

The Sparrow. Matt. 10:29-31.

Lilies, Birds and Grass, and the lesson they teach. Matt. 6:25-33.

¹ *Fishin' Jimmy*. By Anne Trumbull Slosson.

Books for the Teacher

THE following books are suggested as helpful to the teacher of this course: —

- BOTANY (Elementary). L. H. Bailey.
ANIMAL LIFE. A First Book of Zoology. Jordan & Kellogg.
A TEXT BOOK OF GEOLOGY. Albert Perry Brigham.
PREHISTORIC TIMES. Sir John Lubbock.
THE BEAUTIES OF NATURE. Sir John Lubbock.
THE NATURE-STUDY IDEA. L. H. Bailey.
ASTRONOMY OF TODAY. Cecil C. Dolmage.
THE LIFE OF THE BEE. Maeterlinck.
IN BEAVER WORLD. Enos A. Mills.
THE ROMANCE OF THE BEAVER. A. Radcliffe Dugmore.
AMERICAN BEAVER AND HIS WORKS. Lewis H. Morgan.
BLOSSOM HOSTS AND INSECT GUESTS. William Hamilton Gibson.
A YEAR OF MIRACLE. William C. Gannett.
TABLES OF STONE. Henry M. Simmons.
THE UNENDING GENESIS. Henry M. Simmons.

There are many nature studies and essays which will give information, inspiration and delight. Among these are the various books by Henry D. Thoreau, John Burroughs, John Muir, Bradford Torrey, and Dallas Lore Sharp. All these are published by Houghton Mifflin Company, Boston, who will send catalogue on request. The nature poems of Wordsworth (especially "Lines written a few miles above Tintern Abbey") and Celia Thaxter will be helpful, while many anthologies, such as *The Open Road*, by E. V. Lucas, *The Oxford Book of Nature Verse*, and *The Two Voices* (poems of the mountains and the sea), collected by John W. Chadwick, will aid in the religious interpretation of nature.



PART I

The World in which we Live

LESSONS 1-7

Flower in the crannied wall,
I pluck you out of the crannies: —
Hold you here, root and all, in my hand,
Little flower — but if I could understand
What you are, root and all, and all in all,
I should know what God and man is.

Tennyson



LESSON 1

BEAUTY IN GOD'S WORLD: THE CLOUDS

MEMORY VERSE

Bless the Lord, O my soul.
O Lord my God, thou art very great;
Thou art clothed with honor and majesty:
Who coverest thyself with light as with a garment;
Who stretchest out the heavens like a curtain;
Who layeth the beams of his chambers in the waters;
Who maketh the clouds his chariot;
Who walketh upon the wings of the wind.

Ps. 104:1-3

The Purpose

The purpose of this lesson is to introduce in a general way the subjects of the lessons that are to follow, and to draw the children out by asking and suggesting what they may have noticed in God's great outdoor world.

The clouds are a part of nature which all children, those of city as well as country, will have seen and watched. They are used in the first lesson to begin the implanting of that truth which will run through the whole year's lessons, that all nature is working together to fulfil the divine purposes and that God dwells within even the humblest part of nature's life.

Suggestions for the Teacher

The children will have come back from their vacations eager to tell what they have seen in the outdoor world during the summer, and ready to learn more about the

4 THE WORLD IN WHICH WE LIVE

interesting things in nature. They should be encouraged to tell about whatever in nature has seemed beautiful and wonderful to them, but their attention should be skilfully converged upon the subjects given in the story, as opportunities will come later to talk about the other things.

In telling the lesson story of the clouds try to awaken the interest of the child by drawing upon his imagination. Tell it vividly, so as to present a picture before the mind, or to recall one to the memory. In all the telling of the stories awaken the child's consciousness to the marvelous life going on about him, and try to arouse in him a loving interest in it.

When telling the story of the clouds dwell upon the fact that it is God's loving care for the world that sends the clouds and the rain. Begin in this first lesson to instil into the child's mind the fact that God is in and through all things.

Hand Work

The leaflet and the folded sheet containing pictures of clouds are to be given to the pupils. Call attention to the cloud names and have the class repeat them in concert. Ask the pupils to watch the sky during the week and bring the following Sunday a list of the clouds they see each day recorded on page 4 of the leaflet. Refer to the pictures again and again during the year, so that the children will become familiar with these simple forms of the clouds.

OPENING TALK

The story itself opens with the questions and subjects that introduce the topic of the beauty and use of the clouds.

BEAUTY IN GOD'S WORLD: THE CLOUDS

WHAT of all the out-of-door things that you saw last summer did you think the most wonderful or beautiful?

Was it the flowers with their beautifully colored cups, opening one by one, where the bees steal in for the honey, and the butterflies swing on the petals and the humming birds sip the nectar from the very bottom of the cups with their long bills?

Or was it the humming birds themselves, the daintiest and most beautifully colored of all the birds? Did you notice the humming and whirring sound that the wings made when the little birds were hovering over the flowers and balancing themselves while they sipped the nectar? And did you see their glistening, golden-green or ruby-colored throats?

Perhaps it was a bird's nest that gave you joy,—a nest full of pretty eggs, and later, of little hungry birds, which the father and mother birds could never seem to be able to satisfy. Perhaps it was the songs of the birds in the early morning when their music makes the whole world happier.

It might have been the woods that seemed wonderful to you. Perhaps you went with your father and your mother where the trees grew so thick and so tall that they made deep forests where one had to be careful not to lose his way, and where everything

6 THE WORLD IN WHICH WE LIVE

was so still that even the birds hushed their voices. Such wonderful things as one finds in those deep, dark forests! The pretty moss, soft and damp, and so thick that one can walk among the trees without the least noise, if only one can avoid breaking the dry twigs; or the feather-like ferns that sway and bend with the slightest breath of wind, sometimes spreading over the forest floor like a carpet, and sometimes growing in single clusters from a crevice in a rock or from an old rotten stump or beside a trickling stream! Or you may have seen the great rocks which lie in such tumbled masses that one looks in amazement and wonders what broke them up and piled them there!

Did you hear the leaves whisper together when the wind came through the forest? Sometimes the branches seem to sigh gently, but at other times they almost seem to groan. That is when the wind pushes them too hard in its play. When the wind is in earnest it is very rough, and the tops of those great, strong trees bend and wave almost like the tall grass in a gentle breeze. Sometimes the wind is so fierce that it breaks off large branches and blows down the trees themselves.

The wind when it is fierce and strong can blow so hard that it makes great waves upon the ocean. It may be that that was one of the wonderful things you saw last summer. Perhaps you saw the waves come dashing and pounding upon the beach, all crested with white foam, or tossing the spray high up on the jagged rocks with a roar that could be heard a long way off. It seemed strange that the ocean,

BEAUTY IN GOD'S WORLD: THE CLOUDS 7

which had been so smooth the day before, could be lashed into such great waves because the wind blew harder than usual. It seems stranger still to think of the strength those waves have, and what they can do. Did you not see some of the large rocks the waves had lifted and thrown up during the winter storms, or some of the strong walls they had pulled down?

There is one thing you could all see, wherever you were; something that floats above the city streets as well as above the tree-tops, above the mountains and above the surging ocean. It is the clouds.

You must have seen the clouds last summer. Did you notice how they seem to scud across the sky? Did you ever think what makes them go hurrying over our heads so fast? Yes, the wind blows the clouds in the sky as well as the great trees and the feathery ferns and the soft grass and the ocean waves. Sometimes the clouds are blown so fast that where in one moment the sun was shining brightly, in another it would be gone, — hidden behind the clouds.

Those clouds which you see scudding across the sky or stretching over it in such odd shapes are very useful to us. Did you know that they are like curtains to the world, and that they shut off the hot rays of the sun every once in a while? For although the sun gives us life and warmth, and although we could not live without it, yet we could not stand too much of it. On a hot day in summer how thankful we are when a few clouds curtain off the sun and give us relief from its burning rays. Everything seems

8 THE WORLD IN WHICH WE LIVE

glad. The wilting flowers, with their drooping leaves, straighten up. The birds twitter joyfully. The cat and dog get up and stretch themselves and come out of their shady corners.

Then if it should rain, how welcome the shower is and how the thirsty earth drinks up the water; how the leaves of the trees glisten; how fresh the flowers become after their bath; and how sweet the air smells! Sometimes we think that we do not like rain. We hope that it will not rain and we even make ourselves unhappy if it does. "If only we might have pleasant days always," we sigh.

But think what it would mean to have pleasant days always. There would be no pretty, white, fleecy clouds scudding across the sky as if they were playing tag. No great mounds of clouds piling up from the horizon like huge masses of foam. No beautiful sunrises, or sunsets painting all the sky in gorgeous colors. And there would be no rain, of course.

But without rain what should we do? Where would be our flowers, our grass, our shrubs and our trees? Where would be our rivers, our lakes and the vast ocean? And where indeed should we be without anything to eat or drink? We could not live in the world at all if the fleecy white clouds, or the thin, gray clouds, or even those thick, black clouds did not come just so often, and, shutting away the sun, give us the rain that we and everything else upon the earth must have.

You did not think that the clouds were so important, did you? They seemed beautiful and strange



BEAUTY IN GOD'S WORLD: THE CLOUDS 9

and wonderful, and sometimes almost terrible, but did you know that they were more important to us than anything else except the sunlight? When you saw them go merrily across the sky you did not think that they were hurrying to do God's service. You never thought of the clouds as servants of God. Yet that is just what they are, — servants of God. They have helped Him make the great wonderful world what it is and they are still helping Him.

Think again of all those beautiful and wonderful things you saw last summer, and then think what they would be like if the clouds did not do God's bidding and give us rain. Can you think of anything that would be happier or better with no rain at all?

It will be even more interesting to watch the clouds now that you know how useful they are to us. When you see the thick, white clouds rolling up from the horizon, piling themselves upon one another, you will think of them as God's servants getting ready to send us rain. And when you see the white, fleecy little clouds making shadows skip over the grassy fields while they play at hide and seek with the sun, you will feel very happy, for you will know that those very skipping and dancing shadows are bringing comfort to the flowers and the trees, and all the little insects and birds that live among them, — and you will think, "God's servants, the clouds, are very busy trying to help us this hot day."

LESSON 2

EARTH'S GARMENT OF GREEN

MEMORY VERSE

All the earth shall be filled with the glory of the Lord.

Num. 14: 21

The Purpose

It is the purpose of this lesson to show how God's loving care clothes the earth and makes it the beautiful world we know.

Many children believe in God's love and care for themselves and for mankind in general, but have never been taught that God is in and through everything, even trees and plants and grass. They should now begin to see and feel that order runs through even the most common things in life. For that reason this lesson ends with the weeds.

The vegetation which they have loved in trees and flowers, and disliked in weeds, should assume an importance in their minds aside from any use man makes of the different plants. The lessons are planned to awaken gradually the child's consciousness to the fact that law and order reign everywhere throughout the universe.

Suggestions for the Teacher

Keep before the children the fact that you are dealing with nature and the bare places found in nature. Tell them that city streets and squares and gravel pits have

been made by man for his convenience. Yet call attention to the fact that green plants will grow between the bricks of an unused sidewalk and creep far up on an unused road, finally covering it entirely. In time an unsightly gravel bank will be covered with a green growth.

Impress upon their minds the patience with which nature obeys God's law, working over and over to cover again with vegetation earth and rocks left bare by storm or flood or by man's hands.

Show the picture of the fiddle head in the leaflet, after you have read about it in the story.

Hand Work

Ask the children to gather and press some part of the earth's green garment, whatever they are able to get at this season of the year that seems beautiful or interesting to them, such as the frond of a fern, a flower, leaves, feathery grasses, moss or seaweed. If possible the children should select their specimens themselves without any suggestions from the teacher, except that they are to bring some part of the earth's garment that especially interests them, pressed and mounted.

OPENING TALK AND QUESTIONS

What did we call the clouds when we were talking about them? (God's servants.) What do they give to our earth? If there were no clouds should we be happier than we are now? What would happen if it did not rain? (The world would become like one vast desert.)

Show me what clouds you have seen this last week.

Because the clouds do God's service we are able to have upon the earth the beautiful green plants that we shall hear about to-day.

EARTH'S GARMENT OF GREEN

THOSE ferns you saw growing last summer are such beautiful things! When you see a clump of them in the deep woods they look so delicate and soft that they seem like long, green feathers. When a gentle breeze steals through the trees they bend and wave so gracefully that they make the forest seem like fairyland and the ferns themselves like the swaying forms of fairies as they dance in groups upon the forest floor.

The ferns that grow upon the cliffs nod and wave their long feathery fronds at you as if to say, "Come up here with me and see all that I see."

But you cannot get up there. The crevices into which the fern tucks its feet or roots are too small and too far apart for your feet to climb up by, and you cannot get to the fern, nodding so gently to you from its rocky cliff. You wonder how it grew there and how it can keep on growing. Then there are other ferns that cover the smooth rocks or the bare cliffs so thickly that the rocks look as if they were wrapped in a mossy blanket. Sometimes you can hear water trickling down behind the fern, and you almost think that you are in a fairy dell.

Did you ever stop to think how few bare spaces you have seen upon the earth? How some plant or bit of moss will try to grow in almost every place?

God has clothed the earth in a beautiful garment of living green. It creeps up on the smooth, sloping rocks in ferns and moss. It hangs down from the tall, jagged rocks in ferns and vines. It lines the sides of brooks and ponds with all sorts of plants and bushes and pretty flowers. It even grows out into the ponds and lakes as water plants and as the beautiful white water lily, and in the ocean as long fringes of seaweed. It pushes up the country roads in shrubbery and flowers all intertwined with grapevines. It spreads itself out on the earth in woods and in grassy fields and in flower-bedecked meadows.

It is a garment of many patterns that God has spread over the earth to clothe it. And every pattern that makes up this wonderful garment is useful as well as beautiful. How many of these different patterns can you think of?

Everywhere the green robe stretches out to cover the bare earth and some useful or beautiful plant grows upon almost every spot. You know how it is when you make a garden. If you do not sow seeds in the fresh earth, nature will. She has plenty of seeds to sow where you do not sow yours, and sometimes her seeds come up just where you planted yours. You are not always quite sure which of the tiny plants grew up from your seeds and which grew up from hers. If you leave the earth in your garden uncared for, nature will take care of it for you and cover it with growing things. That is God's law for the earth. Nature sows her seeds broadcast, and whenever there is a possible chance they come up.

14 THE WORLD IN WHICH WE LIVE

Even in the desert some things grow,—it is not all a rocky or sandy waste.

Did you ever see a cactus with its thick, juicy stems covered with sharp, bristling spines? That is a plant of the desert. Where do you suppose its roots found the water that is stored up in those thick branches? Men and animals shun the desert because they can find no water to drink, but this plant finds it somewhere under the hot, dry sand, and stores it up for future use. Indeed, animals and men lost in the desert often save their lives by breaking the thick stems and sucking out the water. Strange, is it not, where those desert plants find that water?

And isn't it strange, too, how the daintiest and most delicate little flowers come out first in the spring, when the weather is so cold and frosty that the snow has hardly melted away? Such brave little flowers those wood anemones and hepaticas are! Did you ever pick the little starry-eyed hepatica and see the stems of the flowers and of the tiny new leaves all covered with soft gray fur?

There is the trailing arbutus and those Alpine flowers which blossom just at the edge of the melting ice on the tops of the high mountains. Sometimes these Alpine flowers are so impatient to open that the buds force their way up through the thin, hard ice, and do not wait for it all to melt away. Shouldn't you think they would freeze? But they don't. They keep alive just as the little crocuses do which come up in our gardens as soon as ever there is the smallest patch of green grass showing through the snow.

The ferns are in no such hurry to come up. They

wait until it is warmer, and then out of the earth comes the baby frond all rolled up tight like a watch spring. As it grows it unwinds until the graceful feathery frond is free from its tight roll. These baby ferns are called fiddle heads. Did you ever see any? The humming birds know where to find them, for they line their nests with the soft, brown, woolly blanket that covers some of these baby ferns.

We always think of ferns as growing in the deep, dark woods, or on rocks or beside laughing, chattering brooks. But they grow in great, feathery masses in the open swamps, and they cluster around the boulders in open pastures, and they even crowd their way into the country roadsides. Wherever they can tuck their feet in securely and get their proper nourishment they send up their graceful fronds and help to make earth's garment whole and beautiful.

All sorts of mosses grow on the forest floor and on stumps of trees and on the rocks where the ferns grow. They even grow where the ferns can find no crevice large enough to tuck their roots into. If the rock is moist and shaded the moss will grow so thick that your feet sink away down into it. Some of the mosses are so beautiful that you might wish you were a fairy and could live in such a wonderful little forest. Where the rocks are too dry and smooth for the mosses the lichens put their pretty green and brown and yellow rosettes. Does not nature clothe her rocks beautifully?

If a tree falls down in the forest and dies, losing all of its own fine dress of leaves, the earth tries to put

about it some of her garment. Moss and lichen grow upon it and finally cover it up, so that after years and years it makes a long, moss-covered mound upon the forest floor. If woods are cut down trees will begin to grow again to take the places of the others. There will be another forest there in time unless the stumps of the old trees are destroyed and the land is cultivated.

Nature never gets discouraged. She works over and over again, so patiently, to cover the bare spaces. If it is too bare or too dry for one plant to grow she tries another and another. If an oak tree does not like to grow on sandy soil, pine trees do; and little birch trees will begin to grow on a gravel bank that almost everything else seems to shun.

Even the sand hills back from the seashore are looked after. The wind likes to play with the sand on these hills, and blows it around in shifting masses. So nature plants a kind of grass there that has long, creeping roots. These roots grow so long, and cross and recross among themselves so often, that they bind the sand compactly and the wind can blow only a little off the top.

You know how the rough old ocean plays with the sand and pebbles on the beach and how the waves move them about. But underneath the water, where the waves are more quiet, the rocks are covered with seaweed. Long, slender masses wave to and fro as the tide comes in or goes out. Underneath the seaweed are sea mosses of wonderful colors and shapes, so fine and delicate that they must be floated in water to be seen. The deeper the water is,

the finer and more beautiful the mosses and sea plants are.

It is one of God's laws for the world that it should be covered with growing things. Is it any wonder, then, that nature wants to use the nice, rich soil that you leave bare in your gardens? You like to have it bare. It looks better to you that way and your flowers will grow better in carefully cultivated soil not crowded by other plants. But nature does not wish the earth left unused. She is fulfilling God's law when she covers it up with growing plants. She scatters broadcast every year millions of seeds just so there shall be no waste spaces.

Do not be impatient with the plants that you call weeds. You must pull them up if you wish your garden to grow nicely, but do not fret because it must be done so often. Only remember that they are a part of earth's garment, and that it is God's law for the garment to reach out and cover the whole earth. Remember, too, that nature is always very busy obeying God's law.

LESSON 3

THE BLOSSOMING PLANTS

MEMORY VERSE

Consider the lilies of the field, how they grow; they toil not, neither do they spin: yet I say unto you, that even Solomon in all his glory was not arrayed like one of these. But if God doth so clothe the grass of the field, which to-day is, and to-morrow is cast into the oven, shall he not much more clothe you?

Matt. 6: 28-30

The Purpose

The purpose of this lesson is not only to teach the child about the life of a plant but to open his eyes to the fact that the different things in nature are helping each other. God's laws are so wonderful that any one of his creations in living according to His laws not only lives its own life well but helps some other form of life. This teaching will be repeated again in other forms.

Suggestions for the Teacher

For this lesson the teacher should bring a lima bean, or a pea, or a pumpkin seed, already sprouted, with roots and the first leaves well enough developed to be easily seen by the class. If possible bring also a flower of such shape that the children can see for themselves how the shape of the cup fits the body of the bee.

When telling about the mutual help which flowers and bees give each other, keep the children's attention upon the flowers and the work the bees do for them, as there will be opportunity enough to talk about the bees themselves in Lesson 10. Emphasize the fact that the

bees in getting their own food help the flowers to produce better seeds, and that we in planting gardens for our own food help to improve many of the plants which form the earth's covering.

Hand Work

Seeds should be distributed among the children, the teacher giving directions how to sprout them. The bean, pea, pumpkin, melon or nasturtium seed should be soaked for twenty-four hours in a warm place. At the end of that time place the seed in a tumbler and, holding it against the side, fill the tumbler with damp sawdust. Keep the sawdust damp and keep the tumbler in a fairly warm place, covered by a sheet of glass. Sphagnum moss may be used instead of the sawdust. The whole process of germination can be seen in this way. After the seeds have grown enough to spread apart and hold the first pair of leaves upright they should be taken from the glass and drawn upon the sheet accompanying the leaflet.

OPENING TALK

If men cut down a hill and leave a gravel bank, what does nature try to do? If a brick sidewalk is unused, what happens? If a street is fenced off and unused, will it remain just as it was before?

If you pull up all the little plants that nature sows in your garden and leave the earth bare, will it stay bare? Whose law is nature thus fulfilling? Tell me some of the different places that the garment of the earth covers.

Let us see what parts of earth's garment you have brought to show us this morning.

To-day we are to think how all the green garment of the earth grows from seeds, and how the flowers and the bees help each other.

THE BLOSSOMING PLANTS

WHEN you take a little seed, dry and hard from being kept through the winter, and put it in the earth, what will happen to it? You expect it to grow into a plant with flowers like those the seed came from, do you not? And in order that it may sprout and grow into a fine healthy plant, you take care of it. You water it carefully, if the clouds do not give it rain enough.

But that is not all the seeds must have, just earth and water. They must have warmth as well, or they will not grow at all. Many seeds are in the ground all winter. They are dropped from the ripened seed pods late in the summer or in the autumn, and they fall into the soft earth; but they do not come up. They lie there asleep until something calls to them.

Can you tell me what it is that calls to the little seeds so sound asleep in the moist earth?

The sun! Yes, the sun shines down and calls to the sleeping seeds to wake up. It shines bright and warm, the ice and snow begin to melt away, and the water in the brooks runs free and happy. Children come running home from school.

"Mamma," they cry, "spring has come!"

And sure enough, spring has come. The birds come one by one at first, then in flocks; the trees begin to

show a little green at the ends of their brown branches; the earth dries up so that it is no longer wet and sticky; a soft gentle rain falls, and up come the little plants and flowers, one by one.

It is the warmth that the sun gives to them that makes the seeds stir and wake and then grow. They cannot move about as you do when you wake up and get out of bed, they have to grow up from their beds. Instead of feet, they have roots which begin to grow out of the seed, and go down deeper and deeper into the ground. Now these roots anchor the tiny plant so it will stay right there, and they also feed it by drawing up out of the earth, where the seed had been sleeping so long, just what it needs to make it grow.

After the root has commenced to grow downward the stem appears and begins to grow in an opposite direction. The stem is curved over and bent down as if the little plant were hanging its head, and at the end are two tiny leaves. These leaves want to reach the sunlight, but they are too delicate to push their way through the earth, so the stem pushes its way out of the ground and pulls the leaves out after it. Then it straightens up and the little leaves open and spread out, whole and perfect, because the stem dragged them out of the ground instead of pushing them out.

Did you ever help mother or father plant their gardens? Did you watch to see how the seeds would come up? What was the first thing you saw appear above the ground?

Leaves? No. If you looked closely it was a little looped stem, as if the end of a green button-hook

were coming out of the ground. And then the next morning when you ran around to the garden to see how those nasturtiums or peas or beans were getting on, you saw that the curved green stem had straightened itself and was standing upright with two tiny leaves upon the top, didn't you?

Sometimes the plants grow so fast that it seems as if you could almost see them grow. The sun calls to them so that they shoot up higher and higher, while their roots go down deeper and deeper to hold the plant firmly and to furnish it with food and water. Up from the roots, through the stems to the leaves the moisture goes, but how it can get up the long tubes in the stems without falling back not even learned men can tell us.

Yet, even without the roots to send up the water, the stem of a plant can draw it up. The flower in a vase of water will often last many days because the tiny tubes in the stems, if kept well open at the ends, are able to drink up the water that the flowers need to keep them fresh.

No plant, except a water plant, will grow in water as well as it will in the earth, for the roots take up more than water. They suck up something that is in the earth and which the water dissolves and carries along with it. This mineral salt, as it is called, is very important, for it is the plant's food and even a plant must eat as well as drink. Up into the leaves the food-laden water is forced, there to be made over into a kind of starch which nourishes the plant and makes it grow.

Think how much like us those little plants are.



They have feet to tuck them firmly into the earth, and mouths, only these are on the feet, to take up the food. They have leaves where the food is made into real nourishment and where the plants breathe. Skin very much like our own covers the whole plant, and little tendrils hold up the climbing plants as tightly as if they were hands.

These are not the only ways that plants are like us. They do something besides just growing strong and healthy, with plenty of leaves, just as we do something besides growing into strong, healthy bodies. What the plant does is to blossom.

When the first bud forms, how interested we all are to watch and see how it will open! There are so many things that we want to know about that blossom. What color will it be? What shape? Will the blossom be a single flower or a cluster of smaller ones? Will it open in the morning like the morning-glory or in the afternoon like the four-o'clock, or in the evening like the evening primrose? Or will it be open all day and follow the sun about as does the sunflower?

There are so many different things about the flowers to watch and to think about, and every different thing about them is for some useful purpose. It is not there just for beauty or for show. The beautiful color or the odor; the long tube or the shallow cup; the soft fringe on the edge of some petals; the downy carpet on the curved underpetals of others; the little hairs on the stem and calix; the stamens, the pistil and the yellow pollen,—all these have a purpose.

The yellow pollen which is shaken by the stamens

upon the pistil helps to make the seeds. The little hairs keep away crawling insects that might harm the flower, while the beautiful color and the sweet odor attract to the flower the flying insects that help it.

Did you guess while you were watching the honeybees and the big, noisy bumblebees going in and out of the flowers and gathering the pollen and the nectar, that they were helping the flowers as well as helping themselves? Did you think that the flowers needed the bees to help them? Yet it is so.

The beautiful colors are a device to attract the bees; the sweet odor is thrown out to tell the bees that there is nectar to be had.

For the flowers need the bees. Many of them are quite as dependent upon the bees as the bees are upon them. They need the bees to bring pollen to them from other flowers of their kind so they can have better seeds than they would if the pollen from their own stamens fell upon their own pistils. Many of the flowers could have seeds of their own, while many could not, without the help of the bees. But all seeds are better if the pollen comes from another flower of the same kind.

So while the bees work steadily gathering pollen and nectar for themselves they are helping the flowers to grow more and more beautiful. Their soft, furry bodies brush off and catch grains of pollen when they visit one flower, and leave these little grains upon the waiting pistil of the next. For the bees always visit the same kind of flowers each day and the flowers are arranged in such a way as to assist the bees in getting and carrying the pollen. That is why

there are so many different shapes in flowers. Does it seem strange to you that flowers and bees should be such friends? They work together not only for the good of themselves but for the good of the world.

They tell us that ages and ages ago the flowers were all small and all green and that there were no large beautifully colored blossoms at all. But since the bees have been working upon them, the flowers have grown larger and larger and more and more beautifully colored.

In a fairy story we might read that a fairy touched the little green blossoms, one by one, with her wand and turned them into beautiful flowers of all colors. But this we are telling is a true story. The bees have been the fairies, and their tongues and furry bodies have been the wands that have transformed the green blossoms of so long ago into the lovely flowers we have to-day, with their varied shapes and colors. It has taken a long, long time to do this, so much longer than you can ever dream.

But isn't it quite as wonderful as a fairy story? Isn't it even more wonderful? Doesn't it show that God is watching over everything with most loving care? If He watches over the flowers, intending that they shall grow more and more beautiful and uses the little bees to help Him, will He not watch over all of you, His children, and help you all? The whole world is in God's keeping and nothing that He creates is too mean or small for His care.

LESSON 4

PLANTS SOWING THEIR SEEDS

MEMORY VERSE

And God said, Let the earth put forth grass, herbs yielding seed, and fruit-trees bearing fruit after their kind, wherein is the seed thereof, upon the earth: and it was so. Gen. 1:11

The Purpose

This lesson is a continuation of the preceding one and carries on the growth of the plant to its seed-bearing and seed-sowing. The purpose is the same as that of Lesson 3, but it is intended to open the eyes of the child still more to the marvelous coöperation that is going on all the time in the world about us, and that has been going on since its creation. This truth should give the child a reason why he should trust in God.

Suggestions for the Teacher

This lesson, continuing the life and growth of a plant, gives more emphasis to the thought that "All are needed by each one." As this was a memory verse in the lessons two years ago,¹ ask the children at the end of the hour to repeat it.

Have some of the winged and feathered seeds to show the class, — some maple wings, clematis feathers, burs, sticktights, — so they can see for themselves these different means that nature uses to sow her seeds.

¹ In *Living Together*. By Frances M. Dadmun. The Beacon Press. Page xxxv.

Dwell upon the fact that God cannot watch over His plants with such loving care and not watch over us too. This lesson should be used to increase the child's faith and trust.

Teach with this lesson the three parables which relate to seeds. (The Sower, Matt. 13:1-9; The Wheat and the Tares, Matt. 13:24-30; The Mustard Seed, Matt. 13:31-32.) Can the children tell you what lesson Jesus taught by each of these seed-stories?

Hand Work

Ask the children to make a collection of seeds, and draw or paste them on the sheet enclosed in the leaflet, and to record their list on page 4 of the leaflet.

OPENING TALK

How is it that the baby plant protects its first tender leaves from the rough earth? If the first two leaves and the tiny bud between them were broken off would the plant grow? Do the roots ever grow up? Or the leaves down?

What does the plant do besides grow? Is the blossom just to make the plant more beautiful? Does it have any help from outside?

If we do right and follow God's commandments shall we help any besides ourselves?

To-day we will follow the growth of the plant still further, and see how it is that each plant makes sure there shall be many more plants of its kind, and what helpers there are for this work.

PLANTS SOWING THEIR SEEDS

WHAT happens when a flower fades and dies? Is that all that there is to the life of a plant, to grow, and to blossom, and to die? Is there nothing left, in the autumn, after all the effort of growing and blossoming during the summer but a dry, dead plant?

The seeds are left, the millions and millions of seeds of all shapes and sizes and colors; wrapped in a thousand different kinds of wrappings, and scattered in a thousand different ways. The seeds are the legacy which each plant leaves to the world. Instead of that one plant which grew in that spot during the summer, there will be many more plants just like it from the seeds which it sows.

Earth's garment must not fail, and each plant does its best to provide for more and better plants than itself when its growth shall be stopped and its life shall be over. That is God's law. It is the law for everything, even for a little plant, even for the cold, hard rocks, to go on and on to better things.

Now as the purpose of each plant is to blossom and bear seeds, there must be every arrangement for keeping them safe while they grow, and for scattering them when they are ripe.

Have you ever noticed how carefully the seeds are kept in the different plants? How they are hidden

away under the flower at first, and then, when the flower wilts and falls, how the receptacle grows larger and larger, until the seeds are ripe? Some plants hide their seeds very carefully, like the shy little violet; and others, like the dandelion, hold the seed pods where all can see them and where the wind can easily scatter them.

Every different way in which the seeds are cared for and scattered is the very best way for that special plant.

The violet does not want to have the wind take its seeds, for the wind would carry them to many places where they could not grow. So the violet hides the seed pods under its cloak of leaves. The stems which hold them grow longer and longer and finally, when the seeds are ripe, the seed pods appear above the leaves, split open very suddenly into three parts, and throw the seeds around on the ground about the mother plant.

Did you ever see the seed pods burst open? Did you ever find them standing open all empty except for a few tiny, round, shiny seeds that were left behind when the others were thrown out? Perhaps you have amused yourself by touching the ripened seed pods of the garden balsam or the jewel weed, and watching the seeds fly out when the pods snapped open at your touch.

Not only are these little seed pods of the violet hidden away from the wind, but the seeds themselves are hard and round so the wind could not carry them away. The wood violet must grow in the woods. It cannot afford to have the wind take the seeds and

lose them; and they would be lost if the wind blew them into places where they could not grow. So the plant is made to scatter the little seeds about itself where the soil is good and the conditions are right. There are not many seeds and they must be carefully scattered.

But with the venturesome dandelion all is different. That plant can grow anywhere, and so it flaunts its seed pod in the air just where the wind can get at it and blow away the hosts of seeds, — anywhere and everywhere. The dandelion's seeds are supplied with little feather-tipped air-floats, and when they are ripe and the wind comes to get them, away they sail. They are quite able to sprout on any ground where the wind may drop them, even if it be upon a heap of ashes. But until its seeds are ripe the dandelion is just as careful of them as any other plant. If you will notice you will see that, after the dandelion blossom has wilted, the stem lies down upon the ground until the seeds are ripe. Then up it stands, as straight and tall as when it bore a beautiful golden blossom.

The seeds of the thistle and milkweed have silky fibers that carry them through the air like balloons; while the seeds of the clematis have long feathery tails like plumes, which carry them far away from their parent plant when the autumn wind comes along. The ash trees and maple trees give wings to their seeds so that they, too, can be scattered far and wide.

Have you ever watched a winged maple seed coming down through the air? It turns around and around as it sinks, and if it falls in the grass or soft



earth, it stands upright with the point of the seed sticking into the ground. From that very end of the seed the roots begin to grow. So the maple seed is able not only to go great distances through the air, but to plant itself quite successfully if it comes to rest in a place where it is possible to wedge even a small point into the earth.

The queer tumble-weed is a plant that carries away and scatters its seeds itself. It does not trust to anything else, and when the seeds are ripe the roots dry up and away the top of the tumble-weed rolls in the wind.

There are other plants which depend upon their seeds being carried about by animals or people. They have little hooks by which they fasten themselves to the fur of animals or to our clothing. These are very disagreeable seeds. How we dislike to come back from a walk and find our clothes covered with burs or with sticktights or with beggar-needles! Did you ever see a poor dog trying to get burs off his coat, or a cow with the hair on the end of her tail all matted together with them? Yet, disagreeable as they may be to us and our dogs and cattle, these seeds are interesting because they show how carefully everything is planned to fulfill a distinct purpose.

The birds and squirrels do their share toward carrying seeds and so spreading plants about. Their work is most useful for they carry the seeds of berries and fruits, plants which we are very anxious to have increase. For many plants hide their seeds in a fruit, and many more have seeds large enough to furnish food for birds and animals and man.

Have you ever noticed how many cherry stones a bird will drop around upon the ground? You often find cherry stones in the woods or open fields far away from any cherry tree. Birds scatter blueberries and blackberries and strawberries about, and the crows scatter corn.

Squirrels are very fond of pears. They run up our pear trees and sit up in the branches eating our finest fruit, throwing down upon us, as if to mock us, only the cores. They are especially fond of nuts, which are the seeds of the trees that bear them, and these they collect most busily in the autumn and store away for the winter, some of them in little underground storerooms. Often the squirrels gather more nuts than they eat and those that are left in these storerooms sprout and grow into oak trees, chestnut trees, butternut and walnut trees.

Every one of you must have seen a scarecrow and you all know why the farmers put them in their cornfields. The crows eat the corn that is just planted, and that is a great trouble to the farmers. But, long, long ago, before the farmers planted corn, the crows used to eat it and carry the seeds away. They planted corn in their way then, as the farmers do in their way now. Perhaps if the crows had not carried away the corn and dropped it in different places in those long-ago days, we ourselves should have no nice corn to eat.

We do not like to have the crows eat our corn, or the birds take our cherries or strawberries or blackberries, or the squirrels hide away all our butternuts or chestnuts. But we must remember that they were at work helping these plants to distribute their seeds

long before men thought to plant them at all. This is the food they have lived on for ages, and for ages they have eaten the fruits and nuts and have helped the plants at the same time by distributing the seeds, just as the bees help the flowers when they are busy getting their own food from them. Isn't it interesting to learn how the animals and plants help each other day by day?

The plants' helpers are God's helpers, too.

All are needed by each one;
Nothing is fair or good alone.

The birds and the bees, the squirrels, and the wind are His servants, doing their share to make our world better and more beautiful. And we, when we plant seeds — flower seeds, fruit seeds, or those of trees or vegetables — are helping the whole world as much as ourselves. If we take care of the gardens and try to have each plant healthy and well formed we are making more beautiful and useful the wonderful garment the earth wears.

LESSON 5

THE TREES

MEMORY VERSE

Blessed is the man that trusteth in the Lord, and whose hope the Lord is. For he shall be as a tree planted by the waters, and that spreadeth out her roots by the river. *Jer. 17: 7, 8*

The Purpose

The purpose of this lesson is to give the child a glimpse of the unity which exists throughout God's universe, and to open his eyes to the fact that our physical lives are not so unlike the physical lives of other living things about us.

The part of our life which is vastly different from that of plants and animals is the spiritual nature. That is developed only by reaching up to the light of God's presence.

We must make the effort to reach God's light just as the trees must grow by reaching up or spreading out to receive the greatest possible amount of sunshine.

Suggestions for the Teacher

All children naturally love trees and invest them with an almost mysterious life. When telling the story make the life-formation of a tree seem real and vital. Picture it not as something mechanical, but as a living thing that reaches out with its roots, its branches and its leaves. The activity of the tree is what we wish the children to understand.

Dwell upon the need of sunlight and the tree's active search for it, and lead the children to feel that we, too, must endeavor to lead a life that is full of God's sunlight.

Bring to the class the end of a branch from an oak, a horse-chestnut, a pine, an elm, or a birch, and show the children how one leaf differs from another on the same branch, and how differently they are carried on the ends of the branches and fitted in together to receive all of the sunlight.

Show the under side of the leaves when that point is reached in the story, so all the class can see how different it is from the upper surface.

Think of some well-known place which covers about one-half an acre and refer to it when telling of the maple leaves.

Hand Work

Ask each child to choose some great tree that is accessible and visit it often, thinking of it as his tree and learning from it all the tree has to tell him.

Upon the top of the sheet which accompanies the leaflet have the pupil write the name of his tree, and paste below one or more pressed leaves from it.

OPENING TALK

Are all the seeds that come up in the spring sown by man? Can you tell some of the means nature uses to scatter seeds? What seeds did you find? Tell me how they are sown. Does the parent plant always wish to scatter the seeds far away? What has been helping the flowers for a very much longer time than man has?

Even the great trees come from seeds, and bear seeds which may be sown by the wind, by animals or by man. Let us think to-day how a tree grows.

THE TREES

WHEN you walk through a deep, deep wood do you ever look up into the trees? Do you see the great, solid trunk, and the spreading branches, and the innumerable leaves that dance and rustle together at the slightest breath of wind? And have you noticed how different the leaves are upon the different trees, and in how many ways they spread or hang upon the fine twigs at the ends of the branches?

There are so many leaves it seems as if they must be crowded, but when you look closely you will find that each leaf has plenty of room. It is only when the wind blows that the leaves interfere with each other. When the wind stops playing with the leaves each one has its own place, quite undisturbed by its neighbors.

How does it happen that every leaf, among the thousands on a tree, has its own place and grows unhampered by its neighbor leaves? It does not happen. It is all planned and arranged to be so. It does not just happen that your hands can reach your mouth, or that you can digest the food you eat. That was God's plan for mankind.

And strange as it may seem, the trees are not so very different from us in the way they live and grow, for they, too, take in food and have it digested. Only their mouths are underground and the place where

the food is digested is not inside the trunk, but in the leaves. Just the other way around from us, yet quite as wonderful.

Think for a moment about the long roots of the tree. You know that they fasten the tree into the ground and hold it firmly, but do you know that those roots spread outwards in a fine network of hairlike rootlets that are drinking in food for the tree as well as holding it steadfast and making it secure against the wind? The tree is like a living pump, and up into it from all those hair-like, interlaced roots gallons of water are forced every day. The rootlets suck it up through their millions of tiny mouths; it is pumped by the sunshine up the trunk of the tree and into the leaves where it is made over into the sap which nourishes the tree and makes it grow. The leaves are little kitchens where the water and the mineral salts it contains are prepared for the use of the whole tree.

Now where should you think the heat comes from that is used to prepare this food in those tiny kitchens? From the sun, of course. So each leaf must hang free and have its own place where it can receive the life-giving sunshine and breathe in the air. Every leaf is looked out for most carefully so that it shall have sunshine and air, and God has planned each tree so that it can provide for its leaves.

A tree that has broad, heavy leaves like the horse-chestnut, holds them stiffly and in an exact pattern so that each leaf will stand out free from its neighbor, yet so that all the leaves will fit together and take in the sunlight without leaving waste spaces. The oak

tree arranges its leaves so that they are held out flat or slope down a little. They are long and irregular in shape and there is room for many more of them than of the great horse-chestnut leaves. The elm carries its small, oval leaves on long, slender, drooping branches and the finest of twigs, and in that way it can give free air and sunlight to thousands and thousands of leaves. Look at the great, white pine with its branches of needles, five in a bunch, and yet all held out erect and free like a beautiful blue-green pompon, each needle untouched by its neighbors.

A full-grown maple has enough leaves upon it to cover one-half an acre of ground. Think of all those leaves being planned for! Think of the maple tree growing in such a way, with just so many branches and small twigs as will hold all those leaves free and unhampered! You did not realize that a tree took care of itself like that when it was growing, did you?

Now the leaves on the different trees and shrubs and plants are quite unlike. The shape of the leaves and their texture suits the tree or plant to which they belong. The broad, heavy horse-chestnut leaf is held up by a stout, stiff twig. The slender, drooping branches of the elm or birch would be weighed down and broken by such great leaves, and moreover, if the horse-chestnut leaves were not held out quite stiff and straight they would interfere, for they are so large that they could not help getting in each other's way. Try to think how a horse-chestnut leaf would look upon the dainty twigs of the elm tree!

While the roots are spreading out under the ground in search of water which is taken up into the leaves, the leaves themselves, besides making over the water-food into sap, help to provide the roots with water. For they are arranged like the shingles on the roof of a house and shed the rain-water from the trees so that it will fall upon the ground directly over the place where the finest rootlets, with the most active mouths, are growing. Isn't it wonderful how a tree is planned? The most active rootlets are directly under the place where the leaves shed the water. The tree cannot go about to get its food and drink, so by dripping rain to the ground just over its rootlets the tree helps itself to get the needed supply of water.

Upon the ground near the trunk of the tree, where the older roots carry the water instead of sucking it up, the rain does not fall in great quantities. You have seen the dry places left on the sidewalk near the trunk of a tree when it has rained; and you know how the rain will beat down upon your umbrella from the leaves at the outer edge of the tree.

Some leaves, like those of the oak and maple, are smooth and glossy, and shed the water quickly, and some are hairy like the mullein, where the water stands upon the leaf in great drops. Too much water would interfere with the work of the leaf by clogging up the tiny pores through which it breathes, and so most of the breathing is done by the under side.

Have you ever noticed how different the under side of a leaf is from the upper side? The color is differ-

ent, the veins stand out more, and the skin of the leaf is more porous. For even leaves have skin. The outer covering of all leaves is a thin and transparent membrane that does for the leaf what our skin does for us.

Some trees do not have all the sunlight they need. Can you think what trees those are? Forest trees? Yes, in the forest the sun can reach only the tops of the trees. Have you ever noticed the difference between a forest tree and the same kind of a tree growing in the open field? The forest trees have tall, straight, slender trunks, with no live branches upon them except near the top of the tree.

In the open field a tree has plenty of room and sunlight and it grows into its own natural shape, with great spreading branches, and with the whole body of the tree covered with leaves. All those leaves have sunlight, and the tree puts forth as many as the space permits. But the forest tree can only get sunlight by growing straight up toward it. If it does not reach the light with its leaves it must die, because without sunlight the leaves cannot provide the proper nourishment for the tree. They would be like kitchens without a fire! Some of the trees in the woods have died for this reason.

But the trees that grew straight up, reaching always for the sunlight, have lived. The lower branches have died, and, as the trees grew older, have fallen off and left the trunks tall and smooth almost to the top. There at the top the leaves form a canopy so thick that only little patches of sunlight ever reach the forest floor.

Like the forest tree, we, too, must reach up into the light. The light of God's presence is to us in our lives what the sunlight is to the forest tree. For it is that light shining into our souls which makes us grow to be true children of God.

LESSON 6

HOW PLANTS LIVE TOGETHER

MEMORY VERSE

The earth, O Lord, is full of thy loving-kindness:
Teach me thy statutes.

Ps. 119:64

The Purpose

The “struggle for existence” is touched upon in this lesson, but in such a way as not to be oppressive to the child’s nature. The adaptation of the plant and its necessary struggle will be found to exhilarate and awaken the spirit of courage. The different means by which the plants adapt themselves to their surroundings, and the marvelous order that runs through all things, should be a lesson in faith.

Suggestions for the Teacher

In teaching this lesson impress upon the children the fact that very few of the trees and plants have all the conditions of growth perfect. They must all adapt themselves to their surroundings in some way, even if it be in the long sleep of the seed awaiting its chance to come up.

The description of the ways in which different plants adapt themselves to their surroundings will interest the child, whereas the picture of the plant struggling against adverse conditions would depress him. Make this struggle an interesting one.

Hand Work

Let each child make a list on the leaflet of all the plant societies he can think of, and opposite each write the names of two plants or of a plant and a tree that would be found in that society.

OPENING TALK

Who has visited a great tree since the last lesson? (Let each child tell about the tree visited and describe its trunk, branches and leaves.) Let us see the leaves that you have pressed and mounted.

What is it that the tree must always find? Water, yes, with its roots, but sunlight, also, with its leaves. It must always lift its head up to the sunlight, if it is going to live. Is this always easy to do?

Our story to-day will tell us some of the difficulties plants and trees meet, and how they make the best of the conditions they find.

HOW PLANTS LIVE TOGETHER

OF all the millions and millions of seeds which settle down into the ground every autumn, how many do you suppose come up? All of them? Oh, no. There never would be room for them all. What would become of our orchards if every seed in every apple which a large apple tree bore should grow into an apple tree itself? We should have an apple forest and that would never do, for an apple tree could not bear fruit if it were crowded like a forest tree, and had to grow tall and slender without its spreading branches. Do you not know how few chestnuts you find on a chestnut tree that is crowded among other trees in the woods?

No, the earth has not room for all the seeds to grow, but she sows plenty so she may be sure to have enough plants. Indeed, she must always provide for more than enough. So she scatters her seeds broadcast over the ground, and as many as can, come up. Many of the others just sleep a little longer and wait their time.

Have you not seen blueberry bushes growing in a wood that had been cut down or burned over? Where did they come from? There were no blueberry bushes there before. Did the birds drop seeds enough throughout the wood to make all those blueberry bushes? Or were there some blueberries grow-

ing there years and years ago, when the tall trees that had just been cut down were young bushes, and have the little seeds slept there all that time?

No one can tell. In whatever way the seeds may have become buried in the earth where a wood was growing, when the trees are cut down or burned over up they will come. It is just the same with many other seeds, they will lie asleep for years and never wake until they have a good opportunity to grow. If the ground does not seem comfortable and homelike to the seeds, they will not start to grow at all.

The seeds of the great willow herb, which we call fireweed, are scattered abroad every fall, but only a few come up from year to year, unless, indeed, the ground has been burned over by a fire. Then up they come in masses on that burned ground. A brush pile burned in the woods, or some railroad ties burned by the side of the road, give the seeds the sort of soil they like and up they come.

Where were the seeds before the ground was burned? How did so many of them get to that spot of burned earth? No fireweed had been growing there before. We do not know. We can only say that the seeds have slept.

Suppose there was a little pansy seed that had fallen where the sun shone too hot and too long. The pansy loves the shade, so the seed would not feel comfortable or at home where the earth was baked by the sun and it would lie asleep. But while it was sleeping another seed, which was lying near by, might come up and grow into a plant that shaded

the ground where the pansy seed lay. Up, then, would come the pansy and soon there would be little pansy faces bobbing and laughing where no one remembered ever having seen them before.

All over the world there are places where certain plants will grow together, because they like the same conditions of soil or moisture, sun or shade, and wherever you find one of these plants you will be quite likely to find others. These are called "Plant Societies."

Isn't that an odd name for a group of plants growing together? That word seems to belong to people instead of plants, doesn't it? And yet the plants do just what the people in a society do, pick out and choose those others near which they will grow best.

The starry-eyed little hepatica likes to grow in an oak grove that stands on the side of a hill, where the little plant can be almost buried in oak leaves. The barberry bush likes to grow beside a stone wall. Many other thorned bushes choose a stone wall, too, so where the barberry bush grows you will often find blackberry bushes and black raspberries.

There are certain plants that like marshy ground and many others that grow in the water. The arrow-head and pickerel weed stand waist deep in water and are almost always found together; and where they grow you will probably find also the yellow pond lily and the beautiful white water lily.

These water-loving plants have their roots in the earth; but there are water plants in the ponds and rivers which grow by merely floating in the water.

Many of them are so small they would hardly be noticed, but they are all wonderfully provided with bladder-like sacs for floating the little plant, air chambers for aid in breathing and tiny crossbars to act as rafts to keep the flower stems erect so that the flowers shall be out of the water. Such wonderful provision God makes for all His works! He provides for the little bladderwort floating in the pond as well as for the great, sturdy oak growing upon the side of a hill.

Can you think of some of the other societies of plants?

There is the swamp society, where the cat-tail flag and the bulrushes grow, and where the larch and hemlock trees make dense forests, into which the sun never seems to be able to shine down upon the thickly growing ferns. There is the rock society. What dainty plants grow upon those great tumbled rocks and high cliffs. The red and yellow horns of the columbine and the little pink and yellow flowers of the pale corydalis nod to you from the clefts of the rocks in among the fern fronds. On the smooth rocks the rock saxifrage fits its pretty rosette into every possible crack, while the soft, green mosses creep up and up trying to cover the space.

There are the sand societies. The sand hills which the grass keeps from blowing away is one place where they are found; the desert is another, where the cactus, the yucca and the century plant find the hidden water and store it up for future use. The gravelly hillsides or open land make another, where the white birches and pitch pines grow, and where

the pink moccasin flower stands up straight and tall between its two long, slender leaves.

There are the forest societies and the societies of the mountain tops where the trees cannot grow and where only the little Alpine flowers and strange looking mosses grow up to the foot of the melting ice. And there is the great society which we know best, that of the ordinary fields and roadsides.

Now in whatever society a plant belongs there it will grow best. It may be able to live in another, but it will not thrive. Trees which grow so large and spreading upon the river bank will die if the river is so full that they stand continually in the water, as the plants of the marsh society do. The pretty columbine nodding from a cleft in the rock could not live in the open fields with the bird's-foot violet. Nevertheless it is quite wonderful to see what some plants will do to adapt themselves to hard conditions.

Those forest trees that grow up straight and tall to reach the sunlight do not die, even if they are somewhat crowded. The trees that grow upon the open hillsides have to do battle with the wind; they cannot grow as tall as does the tree on the level plain. They must grow strong to be able to withstand the wind. The energy which the forest trees use to grow tall they must use to grow strong.

In a time of very dry weather many plants will move their leaves. The Indian corn will roll up its long leaves to save the moisture in them from being evaporated and the sensitive plant will shut together the small leaflets which compose the large

leaves. Sometimes it shuts up only a few, but if the drought is severe the sensitive plant will shut up all of them. It will shut up its leaflets, too, if you touch or jar the plant.

Now who would have thought that plants moved their own leaves? Yet, if you watch mamma's plants in the window you will see that they do. Turn around a flowerpot that has been standing where the sun has shone upon only one part of it and see what will happen.

Some leaves will turn their edges to the sun when it is very hot to save themselves from being dried up. These compass-plants, as they are called, point their leaves north and south. They grow in the desert, and many a traveler is glad enough to find one when he has lost his way and the day is cloudy. When the compass-plant happens to grow in a shady place the leaves lie flat like those of other plants.

Then some leaves go to sleep! You have seen flowers go to sleep and open again the next day. The four-o'clock and the portulaca close their petals when their day is over and wake up again on the next. But did you ever see leaves go to sleep? Watch the oxalis in the hanging basket close its little three-lobed leaves when night comes on.

Does it seem strange to you that plants should have some motion of their own? And strange, too, that seeds should sleep longer if they do not find the conditions right for their growth?

It does seem strange. Yet God does not give His creations any law to follow which they have no

50 THE WORLD IN WHICH WE LIVE

chance to obey. He has given the seeds the power to wait their turn and plants the power to help themselves, and in so doing they help to preserve the law and order of the world.

LESSON 7

THE EARTH OUR STOREHOUSE

MEMORY VERSE

He causeth the grass to grow for the cattle,
And herb for the labor of man;
That he may bring forth bread out of the earth.

Ps. 104: 14 (R. V. Margin)

The Purpose

This lesson, the last in Part I, shows how man's co-operation with the vegetable world has been a benefit both to himself and to the plants and fruits.

The lesson of mutual helpfulness is again to be brought out here as it was in Lesson 3. The improvement in the "grass of the field" by man's cultivation is well suggested in the verse from the Bible. The use of the translation given in the margin brings out the thought more clearly.

Suggestions for the Teacher

The story of the birds and the berries is introduced to show how the cultivation of plants might have begun. It is true that some new varieties of fruits have come from seeds probably dropped by birds.

Impress upon the children the fact that man by co-operating with nature is fulfilling God's purpose, and that it must improve both himself and that with which he deals.

Help them to see the whole vegetable kingdom as full of law and order. Bring out the thought that the

52 THE WORLD IN WHICH WE LIVE

improvement in man through his efforts to cultivate better fruits and grains is one of God's laws. When we learn to know God's laws we learn to trust Him.

Hand Work

Let each child make a list of fruits and grains that we use as food. The work should be done independently at home and be brought to the class the next Sunday for comparison.

OPENING TALK

Why do not all seeds dropped on the ground come up the next spring? What happens to some that sleep longer? What does this do for our earth?

What do we call groups of plants that grow together? Where do all plants grow best? How can plants and seeds help themselves?

Do you remember the story of the bees and the flowers and how they helped each other? Here is another of the same sort about the birds and the berries. It will show us how by cultivation and improvement of plants our earth has come to be a storehouse to which we turn for our food.

THE EARTH OUR STOREHOUSE

THE birds and the berries make almost as wonderful a story as the bees and the flowers, for the birds as well as the bees are good fairies to the plants.

Suppose that long, long ago a low bush was growing on a rocky hillside, doing the best it could to get water and food enough from the dry, barren soil, not only to grow, but to blossom and ripen its seeds. The seeds of this bush were not, like those of the wood violet, encased in a hard, dry seed pod. They grew in a bunch about the size of the end of your little finger and each seed was covered with a soft, juicy covering, so that the whole looked like a collection of very small black balls.

It was a blackberry bush growing there upon that rocky hillside. But the blackberries on that struggling bush were not very good; they were mostly seeds with a scanty covering of pulp. If you had picked one and eaten it you would have made a wry face and gone on without picking another. The berries were neither sweet nor juicy, although they looked good to eat.

But the plant was contented with its fruit, even if the few people who tried it in those long-ago days were not. A rocky hillside was the natural home of the blackberry bush. It was quite used to getting along without much water. The leaves were

rather thin, the blossoms were small and the seeds were large and hard, with only the least bit of the juicy black covering.

But although the people who tried the fruit did not like it, and only ate it when they were very hungry or when they happened to see an especially large berry, the birds did like the fruit. They ate as many berries as they could find, and often when carrying them off to their baby birds in the nest they dropped many as they flew, just as they do now.

Many of those berries would fall on other rocky hillsides or on open, dry pastures, and those seeds would sprout and grow into plants like their parent bushes, and bear no better fruit. But some seeds in that long-ago time fell on moist ground. Perhaps the blackberry seeds lay asleep in such a place for a long, long time, just as if it were winter all the year, and never tried to come up at all. It may be that the birds dropped many blackberries in rich, moist pastures before there was one little seed brave enough to sprout.

"I will try it," thought the seed, "I cannot lie here asleep forever and live. I might just as well start out."

So, although the little seed did not feel any more at home in that soft, rich earth than the pauper felt in the palace of the prince, it ventured to send its tiny rootlets cautiously down and then to reach up toward the sun with the first two tiny leaves.

The rootlets grew fast and sank deeper and deeper into the soft, dark earth, and the leaves opened out one by one, quite large and fresh and beautiful.

The brave little seed had grown into a fine, healthy plant, and the sweet, white blossoms were quite the largest blackberry blossoms that ever had been. It was just the same with the fruit. Instead of being the size of the tip of your little finger it was as large as the end of your thumb.

Every year the fruit of that bush would be larger and finer until some day a man would come by who was tempted to try the juicy-looking blackberry. How much better that berry tasted than any he had ever tried before. He would look at it to see if it was really a blackberry bush that he had found in that unaccustomed place. It certainly was, although it seemed strange to see it growing there.

As the man looked a thought must have come into his head! If the blackberries could grow so large and sweet and juicy in that richer and moister earth, why not plant some in that sort of soil, and tend them and make them larger still? Now blackberries grow in gardens, and the berries are as large as mother's thimble. We buy them in the markets and have them on our tables. Was that the way men first started to make a garden, do you think? However they began, the birds had helped long before by scattering the seeds, and so giving plants a chance to try some other kind of soil.

When the Pilgrims came to Plymouth they found the Indians planting corn, and none of them knew where and when it had first been planted. So it is with us. We do not know when men first began to sow in fresh, open ground the seeds that they had learned were good to eat.

When people learned to raise and care for fruits and grains they themselves began to change from savages into more civilized beings. For when they had planted grain they must stay and tend it and wait for it to become ripe and fit to eat. So they gradually ceased their roving life, ceased spending their entire time hunting game and began to live together in groups. So civilized life began with gardens and grain fields.

Have you ever seen a field of tall, Indian corn, with the tassels nodding above the thick green mass? Have you ever seen a field of golden wheat ready to be harvested, or a field of barley or oats? The ripe oats might make you think of long stalks of ripened grass, and for a good reason. All our grain, such as corn, wheat, rye, oats, barley and rice, were wild grass long, long ago before men planted them and took care of them.

Does it seem possible that "just grass" could ever have been cultivated to such an extent that its seeds would become the source of our daily bread? But it is true. For a longer time than you could count, or even think, men have been cultivating these cereals, and they have improved them so much that now we can hardly believe that they were once a kind of wild grass. "The grass of the field," Jesus called these grains.

God's care of the world and of us is bestowed in such a wonderful way that the very commonest part of the earth's covering, the grass, is not only the food for cattle and horses and sheep, but it is also the principal source of our own food. But grass had

to be cultivated for a long time before it became grain. Without that cultivation the wild corn, which was the first parent of our sweet corn, could never have had such large stalks and leaves, or such thick, juicy seeds, or so many of them, as our corn has. And just think of the difference between a little, sour, wild apple and a great, delicious, rosy Baldwin!

Does it seem strange to you that men have also become better and better while they have been busy trying to make the plants improve? It is no more strange than that the bees have made better honey and become more intelligent insects while they were at work helping the flowers!

It is in this wonderful way that God's law works. Nothing can improve without helping other things to improve, and no one can try to help others without being helped himself.



PART II

Animals and Insects

LESSONS 8-17

Ask now the beasts, and they shall teach thee;
And the birds of the heavens, and they shall tell thee:
Or speak to the earth, and it shall teach thee;
And the fishes of the sea shall declare unto thee.
Who knoweth not in all these,
That the hand of the Lord hath wrought this.

Job 12:7-9

LESSON 8

THE ANTS

MEMORY VERSE

Go to the ant, thou sluggard;
Consider her ways, and be wise.

Prov. 6: 6

The Purpose

No child ought to leave the Sunday school after the lesson on ants without a vivid impression of what industry and helpfulness can accomplish in any community, be it a city, a home, a schoolroom, or an ant hill.

Peaceful industry and mutual helpfulness would regenerate the society of man.

Suggestions for the Teacher

Try to make the ant life seem as vivid as possible. Dwell upon the tender care given the baby ants by their small nurses. All children love babies whether they be human or animal.

Contrast the state of the ants that fight and bring home slaves to wait upon them with that of the busy working ants, and enlarge upon the lesson that human beings also suffer from being waited upon too much.

Especially impress upon the children the busy, industrious, peaceful and unselfish life which these ants live, and which makes their great communities possible.

Selfish animals become outcasts. There is no room for them in community life.

OPENING TALK

1. A Review of Part 1.

What is it that wakes up the seed lying so fast asleep in the dark, damp earth? What makes it grow? What causes the forest trees to grow so straight and tall? Why is a tree growing in the open fields or upon a bare hillside so symmetrically shaped, and why is it clothed with so many leaves?

What helps has God given the plant world besides the earth, the water, the sun and the wind? While the bees are working hard to help themselves, what else do they help? How did grass get to be grain?

2. Introducing Part 2.

There are other things besides the clouds, the ferns and mosses, seeds and flowers, plants and trees, which we shall find interesting. Much more like us than the plants and trees are the forms of animal life. People have observed the insects and animals so carefully that they can tell us many things about them, and we will look at them with more interest when we have learned how they build their homes, take care of their babies and learn to live together in communities.

We are to hear to-day the story of the ant, a humble little creature which was thought worthy to be mentioned in our Bible.

THE ANTS

How many of you have ever been to a picnic and seen the ants carrying off the crumbs that you spilled or threw away? Did you notice how hard they worked to drag away a crumb of bread that was very much larger than themselves and how two or three would often push or pull together? All of you have seen ant-hills. Have you noticed the small hill that the little red ant builds along the paths and sidewalks, and the large hills that the black ants build in the fields and woods? Did you know that those hills were cities, large cities, where thousands of ants live together working in peace and harmony?

Long, long years ago a wise man studied the ways of these little insects and made a proverb about them to help and encourage people to live a worthy, industrious life. He wrote:

Go to the ant, thou sluggard;
Consider her ways, and be wise:
Which having no chief,
Overseer, or ruler,
Provideth her bread in the summer,
And gathereth her food in the harvest.

Those who have more recently observed ants and studied their ways, say that he was quite right, and that the ants have no ruler or overseer, — and yet in the cities which they build and which contain

many thousands of individuals, the ants never quarrel, but go about their work from early morning until dark, each one always working for the good of all.

When we speak of nurses and road-builders we think always of human beings, men and women, do we not? Who would think that animals or insects had nursery maids, that they engaged in road building, or kept cows? Yet all these things the ants do, those little ants which we so thoughtlessly tread under foot, and they do it most carefully and industriously.

“But how can they build roads, if they have only legs, and how can they be nursery maids if they have no hands with which to wash the little baby ants?” you might ask. We shall see.

The ants have six legs, but they also have a pair of mandibles by the side of their mouths, which take the place of our hands, and with which they carry things; they also have a pair of long antennæ below their eyes, which they use to clean themselves and their friends and the little baby ants, and with which, by touch, they know their friends and acquaintances. If you look closely at an ant you can see these mandibles and antennæ.

Now in every ant hill there are four different sets of ants: the mother ants, called queens, who are very important; the father ants, who are rather lazy and do not live very long in the hill; the workers, divided up into several bands that do all the work; and the baby ants, who have to be very carefully tended.

The queens are greatly honored by all in the ant city. The others never turn their backs to them,

but always face them when in their presence. Great care is taken of them. They are fed and cleaned by the workers who brush them with their antennæ, carefully and tenderly.

These queens lay many eggs. When the tiny eggs hatch, the baby ants do not come out of the eggs all free as does a chicken. Before they can run about they have to lie a long time done up in a little case, much like the cocoon of a moth, and while they are in the cocoon they need much tender care. This the nurses give, carrying the little cases back and forth into warm and sheltered places, arranging them all in rows according to their size, like classes of children in a school. When the baby ants begin to come out of the cases the nurses break open the outer covering and help them out. For it seems to be impossible for the baby ant to help itself as a little chicken does. The nurse then unfolds its little legs, washes it with her antennæ and feeds it carefully for a few days.

It is then past its babyhood and has become a young ant, and as such helps to care for the other babies done up in their little cases. It scurries around and drags the babies, cradles and all, out into the sun, or away from a draft, or a prowling enemy, or hurries back with it if the sky is clouded over.

The next time you go into the woods or an open field, turn over a flat stone and see if you can find an ants' nest under it. Then watch the little ant nurses hurrying away out of sight, carrying with them the white, cradled babies.

As soon as the young nurses get old enough, that is, when their skin is hardened into shiny armor, they must go outside the hill for provisions, and must help build new roads and tunnels and chambers, and keep the old ones in repair. They are as busy as busy can be all day long, and never stop to rest; only, those who have watched ants very carefully say that sometimes they really seem to play. They run about and jump upon each other's backs, or stand upon their hind legs to wrestle, stroking each other meanwhile in a friendly manner with their antennæ.

The ants which go outside of the hill or city to forage, sometimes go long distances, but they always know how to find their way home again, and they take back to it whatever they find, — a dead fly or a caterpillar, a crumb or a piece of bread. If one ant cannot carry the load alone she goes and gets her friends to help and together they pull and push and tug the morsel to their home. They never stop to eat by themselves any of the food that has been found; every particle is always carried back to the city to be used as food for all.

Besides the food which they store away, they are very fond of the honey-dew which they obtain by milking very tiny green flies called aphids. These aphids live on shrubs and bushes and on trees, and the ants go a long way to find them and to milk them.

You may have seen these tiny green flies upon your rose bushes or grapevines, and noticed ants crawling up and down the stalks. They are after the honey-dew of which they are so fond. By

stroking the backs of the aphids the ants make them give up this sweet fluid, taking it home in their mouths to feed to their queens and to those young nurses that do not go outside the hill.

Some kinds of ants will take the aphids home in their mandibles and keep them in their cities in a sort of stable where they feed and milk them. Some ants will carry them away from the plants where they happen to be, putting them on other plants that they seem to know will make the aphids fatter and so make them give more honey-dew, just as we think our cows give better milk if they feed in a pasture of fresh green grass.

It is supposed that ants keep pets in their cities, for there is a kind of beetle which is found in the hills of many ants which they treat with great care and seeming fondness, stroking it with their antennæ and feeding it. Isn't it funny? Just as we feed and stroke our cats!

Some ants keep slaves. They go out in regular masses like an army and march in order, never scattering or hesitating, on their way to the nest of a certain kind of black ant called the slave ant. Here they engage in battle, and when they have conquered they rush into the city and come out carrying the babies in the little cases. These they take back to their own city, and when the little black-ant babies come out of their cradles they become slaves to the ants that stole them.

In the nests of these slave-making ants there are no nurses or workers of their own kind. The slaves take their places and do that work. The slaves

feed and clean their masters until these masters become so helpless that they cannot feed themselves. They will even lie beside a mass of honey and die without trying to eat it. People become helpless when they are waited upon too much and it is not strange that a little ant, too, suffers from the same cause. God has made all His creatures able to help themselves, and those that do not must suffer.

At the different doorways of the ant hill doorkeepers are always stationed whose duty seems to be to keep out all intruders. They are never absent from their posts, and they feel over with their antennæ every creature that tries to come in. An ant from another hill they will immediately attack, taking it bodily out of the doorway and thrusting it away. They fight, too, with the ants from another hill or city, but they have never been known to quarrel with those of their own company. They even know and will recognize each other after they have been separated many months. If two ants were to be put into a hill, one a stranger and the other one of their own community that had been separated from them for many months, the doorkeepers would stroke both ants with their antennæ; the friend would be received with signs of pleasure and welcome, while the stranger would be caught up and hurried out, sometimes even killed.

How can it be possible that all these thousands of ants in one ant city know each other? They not only recognize each other, but they seem to be such friends that they offer to give help and assistance to one another.

We have heard how the nurses help the babies out of their little, tightly wrapped cradles, how they unfold the legs and smooth out the tiny, crumpled wings with great care and seeming tenderness: how they also feed the queen and comb and brush her with their antennæ. If a queen dies the workers are inconsolable and crowd around her trying to raise her up and bring her to life again. They seem to mourn for her for weeks. When they come across any of their own number in distress they are most valiant comrades, doing everything they can to help the distressed one, even to slinging her over their backs and taking her a long distance back to their hill.

Now these little ants which seem so insignificant to some people are God's creatures. He has made them and He has given them the power to do things which we had supposed we alone could do. Some things they do even better than we can. Think of these ant cities, with all the thousands of their members working so hard to make their own city quite perfect, and best of all, with no quarreling or idleness.

The wise man of old thought that idle people might well consider the ways of the ant and learn to be diligent. The wise man to-day will see how wonderful it is that God's laws are the same for all life. Ants show in their way just what people have learned, that industry and faithfulness are necessary in the life we live together, and that to help one another is the right law for ant cities as it is for our own.

LESSON 9

THE SPIDER

MEMORY VERSE

Let us not be weary in well-doing.

Gal. 6: 9

The Purpose

Continuance in well doing is the special lesson to be drawn from this story. The spider works patiently and industriously, and so fulfills the law of her being. She has no other reward for her perfect work than a little more food.

The reward which boys and girls have for patient industry is manhood and womanhood of ennobled character, of great attainments, and sometimes of real genius.

The lessons upon the lives of great men given toward the end of the book will offer applications of this teaching.

Suggestions for the Teacher

In presenting this lesson of the spider and her web, the interest of the children must not be allowed to flag over the description of the web-making. Use the illustration while making the description, pointing out the resting floor, the guy-ropes, the spokes, and the points of intersection between the sticky threads and the spokes.

The teacher should be sure she understands each step in the process of making the web before she attempts to

describe it. The description from which this is abridged is given in Fabre's *The Life of the Spider*.¹

Dwell upon the spider's patient industry in doing over the same thing each time just as well as she knows how. Then impress upon the children the great reward that God gives us for continued well-doing. Tell them that later they will learn how some men have helped the world and what great things they have done because of their industry and perseverance.

Urge each child to make the free-hand drawing of the orb web the best that he can do. It may be done at home if time for it can not be found in class.

Hand Work

A reproduction of the orb spider's web to be drawn as well as possible free-hand, copying the illustration on the upper half of the drawing page.

OPENING TALK

There was a proverb about the ant in our last lesson which we are to remember. Let us say it together. (Secure concert recitation of the memory verse for Lesson 8.) The ants show us how insects learn to live together in communities. There is another little creature we have all seen whose home is very different from the ant's, but quite as wonderful. When we have had the story, you may tell me in what ways they are alike and in what ways they differ.

¹ *The Life of the Spider*. Fabre. Dodd, Mead & Co.

THE SPIDER

SOMETIMES in the corners of our rooms and in many places out of doors — in the grass, on the bushes, about the fences, and behind the blinds — little creatures live that weave houses out of pure white silk, a silk so fine and delicate that it can easily be torn by the touch of our fingers.

Who are these little silk spinners? Yes, they are spiders, little creatures which we are apt to step upon and kill just because they are spiders. We feel as if we were untidy and careless when we see cobwebs, as we call the little silken house of the spider, in our rooms, or about our houses. But except that the spider's house may seem untidy, the spider itself does us no harm. She does not trouble us, she only catches the flies and mosquitoes which come into our rooms and which we do not want there.

Have you ever seen a spider sitting within the doorway of her house, watching with her eight bright, black eyes to see if a fly will alight upon her web? Flies do so alight, and when they do, they seem never able to get away again. What does the spider do to keep them there? And why can she run so swiftly over the same silk carpet that holds the fly's feet so fast? If you will look very carefully you will see the finest of silk threads running back and forth above the carpet. They are all criss-

cross, and they make a net-work in which the blundering fly or mosquito or miller is sure to be caught. Then out the spider runs and binds it up in strong silken ropes.

You have to be careful, when you walk over dead branches in the woods, not to trip, do you not? Supposing you had six feet instead of two, how soon do you suppose you could disentangle them?

So the spider weaves with great skill and great care her smooth white carpet to run upon, but up above she makes tangled threads of the finest, strongest silk she can spin, knowing that the inquisitive fly will blunder right among them and be caught.

Did you ever see a spider make her carpet? No, because she works at night. At night, when we are sleeping she is working hard, spinning the silken thread and weaving it into the finest and softest of carpets; and then all day she sits and watches for her food. She never seems to sleep, but is always watching in the daytime and working at night. We could not work so hard as that, for we must sleep at night and rest a little in the daytime. But the spider, from sunrise to sunset, is feeling with her feet and watching with her eyes to see if there is the slightest quiver of the silk to tell her that some fly has alighted upon her web. Did you ever put a little piece of straw or a tiny leaf upon a cobweb and watch the spider dart out, seize the straw, drop it, and run back disgusted?

The house spider makes a three-sided carpet in the corners of an unused room or of a cellar or barn,

and she often puts bits of plaster upon it so it will not be blown up and down by the currents of air. We put stones upon pieces of cloth which we have put out to bleach upon the grass, to keep them from being blown away, but would you think that a little spider would know enough to put pieces of mortar on her silken carpet to keep it from blowing about?

There are many different kinds of spiders and all of them make different sorts of carpets. You know how on some summer morning you look out and see the grass all covered with dainty, silken tents. When the dew dries away we no longer see the tents, for the silk is so fine that they are almost invisible unless wet by dew or fog. A hard rain ruins them and so do our feet as we walk across the grass. But the next night all those little spiders are at work again and by the following morning the grass is covered once more by the dainty, silken tents.

One spider, which children call the golden spider, spins an open-work carpet of silken ropes and threads in the shape of a circle. It does not lie flat but hangs perpendicularly in the air. This is something like little crocheted mats or doilies and not at all like the house-spider's carpet. Should you think a mere spider could spin anything so exact and so wonderful as this web? How do you suppose, in the dark night, she can make all the spokes of her wheel so perfect and divide the spaces so evenly?

Could you draw a picture of this golden spider's web? Try it and see if you can draw as evenly as the spider can spin. And remember that she has to hang her web across the tips of branches and

must divide her circle into just so many equal parts without anything to guide her but her sense of space; while you have your hands and your eyes, and a picture of the web to look at and to copy.

Has not God given the little spider a wonderful gift that she is able to spin such a perfect web? Would you like to know how she goes about to make it?

About nightfall, the spider comes to the end of a twig, and, after sitting there awhile as if to see that nothing would interfere with her web, she suddenly drops down with her eight legs wide spread. By the light of a lantern you could just see the fine silvery rope she spins as she drops. When she has almost reached the ground, she turns and climbs up the rope, spinning and twisting as she climbs, to make it thicker and stronger. Then she sits once more upon the end of the twig and waits until the wind shall blow the filmy rope aside and make it catch upon some other twig. Patiently the spider waits; she can do nothing unless the wind helps her. Just a little breeze, — and the end is caught, and over the bridge the spider hurries to see if her guy-rope is fastened to a suitable mooring. If it is, she runs back and forth upon it several times, strengthening it each time with new silk which she spins from her spinnerets. When she is satisfied that the guy-rope is strong enough, she attaches other ropes to twigs or branches, and so outlines the space she is to fill.

But now she must make her spokes or radii to this wonderful wheel she is about to spin. From top to

bottom, she fastens a stout thread which in the center has a thick, white point made of a little, silk cushion. This is to be the center of the wheel, and from the center the spider starts to the outside ropes, fastens her rope and returns. From this center she runs here and there, sometimes in one direction and sometimes in another; sometimes placing spokes on one side, then going over and placing an equal number opposite, as if she knew that her wheel would drag apart if it were not properly balanced.

While one is watching her it seems as if she were working in the utmost disorder, but when she has finished her wheel, each spoke is perfectly placed, she has put in just as many as her kind always puts in, and they are equi-distant.

Now she begins to put in the rope that coils around the spokes. Placing herself in the center, on the silk cushion, which has grown larger and larger while the spokes were being laid, she slowly turns around and around, and, with a very fine thread, she winds a spiral from spoke to spoke, carrying the thread on her back feet and placing the coils on the spiral very near together. She works this way until she has a "resting floor" about the size of the palm of your hand, then, spinning thicker threads, she places them farther apart for her spiral until she reaches the outside ropes.

Is her web done? Oh, no! The larger part of the spiral must be done all over again. She has only put in the coarse threads to hold the spokes in place. This time she begins where she left off and weaves toward the center with a sticky rope. This she

fastens, as she spins, to each spoke of her wheel, going around and around her circle; drawing nearer and nearer to the center, with perfectly even spaces between her sticky ropes; and taking up the first made spiral as she lays the new one in place. While she spins and fastens her ropes with her hind feet, with her fore feet she picks up her old thread, and rolling it up places it upon the spokes, while her four middle feet carry her about on the web and keep her from falling to the ground.

Could you do so many things at once? And did you ever think before that a common spider could be so skilful? It is hard for you to do different things with your two hands at once. Suppose you tried to do different things with four pairs of feet and your mouth, how would you succeed? Would your brain tell your hands and feet and mouth just how to do it all perfectly? Yet we think the spider has no brains: we dislike its ugly, fat body, which is really a marvelous little silk mill, and we kill this little creature to whom God has given gifts which we ourselves do not possess.

Think of the patience of the spider! Spinning night after night her web, for it is the only way she can get her food; and her ropes are so delicate that the web seldom lasts over one day! Yet the spider spins and weaves, spins and weaves, waiting for the breeze to place her thread in the first place, and then going through with every part of her work with as much care and precision as if it were to last always.

God has given us far more gifts than He has given to the spider. I wonder if we use our gifts as well?

LESSON 10

THE BEES

MEMORY VERSE

The judgments of the Lord are true and righteous altogether.
More to be desired are they than gold, yea, than much fine gold;
Sweeter also than honey and the droppings of the honeycomb.

Ps. 19:9-10

The Purpose

Even more wonderful than the story of the ant is that of the bee. Interesting as it is, it will fulfill its purpose in this course only when it has awakened an increased wonder and reverence for our world, and helped children to think of the promptings of instinct as the voice of God.

The obedience of this little creature to the law of its life helps awaken a desire in the hearts of God's children to fulfill through willing obedience to His laws His divine purpose for our lives.

Suggestions for the Teacher

Any account of the bees and their work is very interesting to children. They will probably know more or less about them already and they will want to tell what they have been told and what they have seen. They should be encouraged to tell what they themselves have noticed, in this lesson as in all the lessons, but time enough should be kept to give them the story of the bees' life as it is given here.

Make clear the fact that the bees, as well as the ants, have no overseer or ruler, and that they do their work, so skilfully divided up as it is, in obedience to the law which has been given them and which we call their instinct.

Try to make the children understand that a conscience that is listened to and followed habitually is a sure guide to help us in obeying God's law.

OPENING TALK

Let me see the drawing of the spider's web which you have made. What can you tell me about the skill of the spider? About her perseverance? What shows her patience? Repeat the memory verse for last week. What reward do we receive for not being weary in well-doing?

Did you know before that the little creatures about us, like the ant and the spider, could do such wonderful things? There is another insect you all know which lives a remarkable life in communities, which makes something we like to eat. It is — yes, the bee. Mr. Maeterlinck, a famous author in Belgium, that wonderful little country you have heard so much about, kept a colony of bees in a glass hive so that he could watch them at work by just lifting the dark cloth thrown over the glass. Wouldn't you like to do that?

THE BEES

Who has watched a honeybee getting honey and pollen out of the flowers? The bee thrusts a long tongue down into the flower cup and brings it back all covered with yellow pollen. And have you ever seen the little pockets or baskets which she has on her two hind legs and into which she puts the yellow pollen as she gets it? Isn't it funny to think of a bee with little baskets fastened to her legs?

The next time you see a honeybee or a bumblebee, watch ever so closely and perhaps you can see her put that pollen into those little baskets on her legs. Quickly she brushes the pollen off her tongue with the combs of hairs on her fore legs, then she brushes it off her fore legs with her middle legs, and then with the feet of her middle legs she pats it down hard into the little baskets.

You will have to watch sharply, for the bee is very quick and nimble. She cannot spend her precious time just packing away the pollen, she must gather all she possibly can while the sun is out and the flower cups are open. When well laden she flies for home where she unloads the pollen in great haste, kicking it out of each basket with the other hind foot, then off she goes again to gather more.

Sometimes it takes a great while for her to get a load, perhaps a whole morning; and yet she never

seems tempted to go to any other kind of flower than the one from which she first commenced to gather the pollen. That is the law of the hive which the bees always obey. Sometimes they visit twenty flowers in a minute, so hard do they keep at work, and such small bits of honey or of pollen do they find in each flower. Yet no bee would leave that particular kind of flower upon which it commenced to work that day for any other flower, however full of pollen or of honey it might be, so faithful are they and such hard workers.

Why do they work so hard? Is there any other bee which forces them to do it? No, the bees are like the ants. The little workers seem born with a determination to make their colony the best and happiest and most prosperous community of bees that can be, and they work every minute to make it so.

Suppose we follow home these little workers which have been busily collecting the pollen and sipping the honey, and peep into the hive when they come in. At first everything seems in the utmost confusion. There is such running about, such flying around as if every one was in a great hurry. What can bees accomplish, you think, that run about in such confused masses? But wait a few moments and you will see that a wonderful order comes out of this apparent confusion.

Inside the hive is a real city built up with wax cells. These are used as rooms for the babies and for storerooms for the pollen and honey. The bees are always increasing these cells, just as in our own

cities we are always putting up new houses. Now how do you suppose the bees get the wax with which they build up this city of theirs?

Why, they make it themselves and in a most marvelous way! Certain of the bees seem to know that it is their business to furnish wax. They begin their work by a feast of honey and then hang themselves up for a day and a night in a close, heavy bunch at the top of the hive. They must have eaten just so much honey, and they must be just so warm before the wax can be made. Patiently they wait for the scales of beautiful, white wax to grow. It seems almost like magic, but after about twenty-four hours tiny scales of shining white wax begin to slip out of the four little wax pockets on the underside of the bees' bodies. Then suddenly one of the bees will seem to wake up and she will leave the rest and hurry up to the roof of the hive. There she will very carefully fasten her bits of wax after she has chewed them and moulded them and snipped them to suit her fancy. Others will follow her, and they will begin to build the waxen comb.

If only you could see the bees building their wonderful cells! One bee goes and gets the wax and, placing it where the cell is to be, runs away for more. Another trims it with the nippers on her legs, twists it into place, and goes off for another piece. Bee number three hurries up, gives it another poke and twist, and hurries off while bee number four tries her skill.

How do they know how to build those tiny flakes of wax into the beautiful and regular cells? How



do the spiders know how to divide up their wheel into just so many spokes? We cannot tell, we cannot even guess, for these are secrets between these little creatures and God, who gave them their gifts.

Now the queen bee wishes to lay some eggs in those beautiful waxen houses, and you cannot think how those little workers hurry about and scramble over one another to build them fast enough to suit her. And when she comes to see how they are progressing, how do you suppose she comes, this queen bee, who is the mother of the hive? Walking over the others as the workers do? Oh, no! She comes with a steady, stately step, surrounded by a circle of attendants whose duty it is to watch her, fan her with their wings, stroke her with their antennæ, feed her carefully and always face her. When she comes, all the other bees, no matter how hard they are at work, draw back and leave an open path for this queen and her circle of attendants. Isn't that just like a story of a real queen out of your story books?

Just as your mother looks to see that the crib is all comfortable and nice before she lays baby brother or sister down in it, so this queen bee pokes her little head into each waxen cell to see that it is right before she lays her egg in it. Of course we would expect our mothers to be careful about their dear babies, but who would have thought that just an ordinary little mother bee would be so careful of the place where her baby was to live?

So the queen bee goes about from one cell to another and lays so many eggs that the little builders

have to work fast to keep up with her. They must make wax and they must make the little cells out of the wax. They must gather the honey and the pollen and store it away. Then they must make real honey out of what is brought in from the flowers, by standing and fanning it with their wings. And they must mix the pollen with a little honey to make bee-bread of it. The workers can have only bee-bread to eat, but the queen must always have a special kind of honey.

The little babies when they hatch from the eggs must be taken care of and fed, and when they are ready to come out of their rooms they must be helped out. Then they must be carefully tended just as the ant babies are tended by their little nurses. The bee nurses are just as careful as the ant nurses. They help the baby out, they smooth the tiny, crumpled wings, and they straighten out the six little folded legs. They wash the baby by licking it with their tongues just as a mother cat washes her kittens; they comb the baby's hairy body with the combs they carry on their legs, and they feed it with drops of honey. After all this nursing the baby is considered a baby no longer; and just as the ant baby turns into a nurse, so the bee baby, after she has been washed and combed and fed, begins to help the nurses with the other babies. After she has nursed awhile she is allowed to go out and get honey.

But the work of the bee city is not half told yet. As soon as the babies have left their rooms, bees come hurrying up to clean out the little cell so the



queen bee can lay another egg in it, and all the little bits of wax and the unused food in the cell are taken up and carried out of the hive and dropped over the edge of the doorstep.

All the time the city is being cleaned up in just that way. No stray particles of anything are allowed to cumber up the city or make it untidy. Then, too, there must be fresh air. The bees, like the ants, love the dark, so they provide only one very small door. This does not let in air enough, so the bees ventilate the hive by having groups of workers stand near the door to fan in the fresh air with their wings. We always supposed the bee used her wings just to fly with. Who ever thought she used them as fans,—fans to evaporate the water from the honey, fans to keep the queen comfortable, fans to ventilate the whole hive, and fans to keep the babies warm in their cells so they will grow up faster.

With all this work to be done, do you wonder that the bees are busy? Does it not seem as if they planned out their work? As if they said to each other, "Here, you do that and we will do this and then we will change about." Some arrangement must be made among them or everything would not be done so carefully. No one ever knew of a worker bee getting interested in her play and forgetting to gather the honey, or sitting lazily about and letting some other bee do her share. The workers never do that, but the drones do. They are very lazy just as they were in the ant city, and do you know, the workers stand it just as long as

they can and then they turn the drones out of the hives. The drones do not seem to know how to gather honey and so they die. Poor, lazy drones!

What tells the bees to do these things and to do them so well? Do you suppose there is a little voice inside of them like the little voice inside of us that tells us when we are doing right or wrong? If we listened to the voice more often and more closely would it not talk to us more?

We call our little voice our conscience and we call the little voice that tells animals what to do instinct. We say, "They do this by instinct," meaning that there is a little voice within them which tells them what to do. That is God's voice, telling the little insect how to use the gift He has given to it.

Suppose the little insect did not listen to the voice or did not obey it? Oh, but the little insect does listen and does obey just as well as it can. That is why the beautiful waxen cells are all so regular; that is why honey is stored for the winter; that is why the bees work so hard instead of playing; and that is why their city is so well governed without any ruler.

If we all listened very hard to the "still, small voice" within us, do you think we might govern our cities better, and our homes and our country?

Why, if everyone listened to the "still, small voice" there would be no wicked people, — all would be working busily to make their home and their city and their country the best home and the best city and the best country in God's wonderful world.

LESSON 11

MOTHS AND BUTTERFLIES

MEMORY VERSE

Eye hath not seen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him.

1 Cor. 2:9

The Purpose

The metamorphosis of the caterpillar into a butterfly has been used again and again as a lesson on immortality. A child instinctively trusts the future. It is not until later that doubts arise. But a lesson learned in childhood, though not needed then, will come back in the time of need and help to keep faith triumphant.

Suggestions for the Teacher

In presenting this lesson to the children it should be made quite plain that only a few species of the caterpillar do harm to our trees and gardens, and that those are the ones that the birds do not eat on account of their thick, hairy covering. The other species, excepting the smaller varieties, that is, the cankerworm and inchworm, are not numerous enough to do any real damage to our vegetation.

The difference between moths and butterflies should be emphasized. Some of the class may have seen a moth or a butterfly emerge from its cocoon or chrysalis and expand its wings before it flew away. Let one who has seen it tell the others about it.

The caterpillar obeys its instinct and does what it is impelled to do with no understanding of its own act, either before or after the change.

But we should feel the most implicit faith and trust in our Maker from seeing the marvelous second life He has prepared for some of His lowliest creatures.

OPENING TALK

How many insects have we studied about thus far? Where do ants make their homes? Spiders? Bees? What law does each follow?

There is one story almost more wonderful than any thing else in our world. Perhaps some of you know about it already, — the change that comes to a caterpillar through its enchanted sleep. I wonder if it will help us to think of the surprise God may have in store for us, some day?

MOTHS AND BUTTERFLIES

Do you remember seeing last fall a thick, brown, woolly caterpillar that was hurrying away as fast as it could go? Did you wonder where it was going and why it was in such a hurry? It traveled over the ground so fast that it seemed to have a set purpose of its own, as, indeed, it had; for it was hurrying away to find a cozy spot in which to spend the long, cold winter.

The sharp, frosty autumn air tells the woolly-bear caterpillar that winter is coming and it hurries about, through the grass and across the sidewalks, anywhere, everywhere, to find a crack or corner for its winter home. When the little nook is finally found it curls up into a tight ball and sleeps away the long winter just as the real bear does for which it is named.

In the spring when the sun melts the snow and the days begin to be warmer, out it comes from its tiny, cozy corner just the way the big, brown bear comes from his cave where he has been curled up asleep so long. They both hunt about to find what they can to eat, for they are very hungry after their long sleep.

The real bear wanders about through the woods. He eats what dried berries and leaves he can find, but no matter how much he eats he always remains a bear. But the little woolly-bear caterpillar does

not always remain a caterpillar. When it has had plenty to eat and is quite fat, it goes away by itself once more and curls up into a tight ball, and then instead of going right to sleep it first weaves for itself a cradle or cocoon out of silk, weaving in the long brown hairs that cover its body with such a thick coat.

In that little cradle it sleeps very soundly. So deep and sound is its sleep that one would think it dead. But the caterpillar is not dead. It is only changing its form within that closely woven bed. It was a caterpillar when it stripped off its little fur coat and rolled up in it; when it bites a hole in the fur coat wrapping and comes out, it is a moth, a pretty, white and yellow moth with black spots upon its wings and body.

It is just as if a fairy had touched the crawling caterpillar with her wand and while it slept an enchanted sleep had changed it into that pretty, winged creature. But the wand that touches the caterpillar in its deep sleep, and bids it live again as a butterfly, is the law of God for its being. Is it not a marvelous thing?

Just think of a caterpillar, a common-looking creature with its shapeless body and its many short legs, being changed into a butterfly. Think how different the butterfly is with its graceful body, its six long, slender legs and its beautiful wings glistening with gorgeous colors.

By day the butterflies sip the nectar from the flowers, flying hither and thither in the sunlit air. At night they go to sleep. The moths, on the other

hand, always sleep away the sunny hours, then wake up and fly about at night. Although they choose to fly in the dark, they seem to be so enchanted with our lamplights that they cannot keep away from them and are often burned in the flame. Poor, foolish little moths!

Often in the daytime you can see these moths resting in the shadow under leaves or on tree trunks with their wings widespread. And often when you walk in the deep grass or among low bushes the moths will fly up and then go back to rest again.

You can always tell a moth from a butterfly in these two ways. The butterfly loves the sun and the flowers that open in the daytime and so it flies about by day. When it alights upon a flower or leaf, or upon the roadside, it closes its wings together over its back. But the moth sleeps by day and flies by night, and whenever it comes to rest it spreads its wings wide open.

Butterflies and moths do not harm plants; but the caterpillars from which they develop eat the leaves of trees and plants. Some of them, the hairy ones, do much harm, for there are so many of them that they eat all the leaves, and that kills the tree. Few birds like hairy caterpillars and most birds will not eat them. But the smooth caterpillars the birds do eat, and because of that there are seldom enough to do our trees any great harm. It is the smooth caterpillars that change to butterflies.

Did you ever see or hear a caterpillar eating its dinner?

It is a very greedy little glutton, for it eats all the

time until it makes its cradle and goes into that deep sleep which ends in its change into a beautiful, winged creature.

The mother of a caterpillar is a butterfly or a moth. She lays her pretty eggs upon a leaf of the kind of plant which she knows is good for the caterpillar to eat, and then off she goes and leaves them for the sun to hatch. Butterflies and moths are not so careful of their babies as the ants and bees or as the birds. But when the sun has hatched the baby caterpillars they find themselves sitting upon their own dinner table, and they do not have to hunt for food, it is right there spread out before them. They do not waste much time in getting to work, either, and they very quickly have eaten so much that they have to change their skins. That is the way insects grow. As soon as one of these baby caterpillars has eaten as much as it can hold, it crawls away from the edge of the leaf and makes a tiny silk cushion or button which attaches the end of its body firmly to the leaf. Then the skin upon its head cracks and splits open and the baby caterpillar pulls itself out of the old skin.

It is a very pretty sight to watch it. First it wriggles its neck free, then pulls out, in succession, each pair of feet, pushing the old skin down with each foot as it is pulled out. Finally it pushes the old skin away with the last pair of feet, and is free. It is done just the way you might take off one of your garments, pulling out your arms, then pushing it down and stepping on it to pull out your feet. Think of a baby caterpillar taking off his skin

just as children take off their clothes. Is it not curious?

When the skin is all off and the caterpillar is free, it is almost twice as large as it was and it is generally a little different in color and with different spots, just as if it had a new dress. It changes its skin very often, every time it has eaten enough to make it grow a good deal larger.

While they are wee babies, these caterpillars all eat along the edge of the leaf they were hatched upon, but as they become larger they go to different leaves, and when they are quite large they eat a leaf up with great rapidity. They make such a noise as they eat that you can easily hear them biting off mouthfuls of the leaves if you happen to be sitting under a tree which is their dining room.

You would laugh if you could see a large, full-grown caterpillar begin on a fresh leaf. It seems to be the hungriest sort of a creature and walks around the edge of the leaf, eating as it goes. Its mouth opens sideways and not up and down, as our mouths open. So, as it walks around the leaf's edge, hugging the leaf as it goes, with a foot on either side, the mouth of the caterpillar gobbles up the leaf like a machine. It does not even have to stop to breathe, because it breathes through spiracles or little holes all along its sides.


Now after this caterpillar, or little eating machine, has changed its skin several times, it is about ready to roll itself up into its pupa case, or make a cocoon. So it eats just as much as it possibly can hold and then hurries away to find a place suitable for the

enchanted sleep which will end in the glorious, new life of a butterfly or moth.

If it is the kind of a caterpillar that is going to change into a butterfly, it fastens the end of its body to a twig or the side of a house by the same kind of a silken cushion it made when changing its skin. Then it weaves a fine silken rope around its neck and attaches the ends to the same support, so it hangs like a tiny hammock. Then for the last time the skin is changed, and the old skin drops away leaving our caterpillar a very different looking thing from what it was before. It is so different in shape and color that no one could guess, unless he knew, just what it was.

Within this odd-shaped chrysalis the wonderful change is going on of which I have told you. The caterpillar is transformed, and out of the broken shell of the chrysalis crawls a limp, wet creature, looking like a drowned butterfly. It hangs by its feet to the chrysalis, pumping from its swollen body into the dainty, crumpled wings the liquid which will unfold and strengthen them. Gradually the body shrinks in size and becomes drier and the wings unfold and spread open, — then away it flies in all its beauty.

The caterpillar which is to become a moth makes a different cradle for its wonder sleep. It does as the woolly-bear caterpillar does. First, it weaves a silken cocoon around its body, then it sheds its skin for the last time and changes into a chrysalis within the cocoon. It is very interesting to see the caterpillar weave the outside threads of its cocoon.



It moves its head slowly from side to side, crossing and attaching the threads until it is hidden from sight, and in secret it finishes the work. When the change that goes on in the cocoon is completed, the moth pushes its way out of one end of the cocoon and hangs like a crumpled mass, as did the butterfly, until the wings are smooth and dry. Then away it goes to hide until nightfall.

How marvelous is this change! No sleeping princess in a fairy tale could have a more wonderful awakening, nor could a fairy's robe be more enchanting than the soft, velvety wings of the butterflies with their exquisite colors.

Does the caterpillar know that it is to become such a beautiful creature? Is that why it hurries so and eats all it can night and day, to be ready more quickly for its wonderful future?

The caterpillar does not know why that sleepy feeling comes on. It does not know that it will wake up and find itself one of the most beautiful of all creatures. It does not know that the end of its crawling about has come and that after the long sleep it can fly through the soft, transparent air and sip the nectar from the sweet flowers instead of having to chew the tough leaves. It only obeys that "still, small voice" that speaks to everything in this world and tells it what to do.

Suppose the caterpillar tired of changing its skin and stopped eating before it was as full grown as its companions, what would become of it? Would it become a smaller butterfly than the others, after the enchanted sleep? Oh, no! It would become no butterfly

at all. It would never come out of that sleep, because it would not have stored up in its body enough strength to undergo the change. It is only by doing what its instinct tells the caterpillar to do that it can become the beautiful, fairy-like creature it is God's purpose for it to be.

We do not know just what God's purpose is for us when we are through with this body in which we dwell, but it is no doubt something far more wonderful than the happy, care-free life of the butterfly. "Eye hath not seen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him."



LESSON 12

TOADS, BATS AND OWLS

MEMORY VERSE

And God said, Let the earth bring forth living creatures after their kind, cattle, and creeping things, and beasts of the earth after their kind: and it was so. And God made the beasts of the earth after their kind, and the cattle after their kind, and everything that creepeth upon the ground after its kind: and God saw that it was good.

Gen. 1: 24, 25

The Purpose

The purpose of this lesson and the one following is to give the child more of an insight into the activities and industries of the living creatures about him. Instead of feeling repugnance when they look at toads or bats, children may learn to be interested in them and know their value.

“The law of the Lord is perfect” applies to the life of other creatures as well as to our own. When mankind ruthlessly destroys animals, however small and insignificant they may seem to be, without due knowledge of their activities, he may be thwarting that law and in many cases is directly harming himself.

Suggestions for the Teacher

In all probability the children will have become familiar with the life history of the toad from the hatching of the eggs to the time when the tadpole emerges, tailless, from the water. The later history of a toad's life they do not

know so well. But they should understand that any member of that family, — frogs, toads, and tree-toads, — are of great help to us in ridding us of harmful insects.

They should understand, too, that harmful as applied to the insects means harmful to us in our way of living, or to the plants and trees which we cultivate.

Many of the animals and insects most harmful and obnoxious to us have been brought here from other regions where they do no harm. For example, the potato-beetle is a native of the Colorado desert. In its natural home it was rather scarce owing to lack of food, but it acquired a great liking for the potato which the pioneers began to plant in the west. As the potato is extensively cultivated throughout the country, the beetle has followed it and has increased so enormously as to be a menace to this food crop. This, however, was man's fault or misfortune. The beetle in its own home, living on the food which nature provided for it there, did no harm.

The teacher, by such illustrations, should try to make clear to the children man's responsibility in disturbing the equilibrium of the world.

OPENING TALK

What is the most beautiful insect we have studied about thus far? Is it the most useful? What is the real use of beautiful things? Who is the mother of the caterpillar? Can you repeat the verse which says that a surprise is waiting for us?

Some of the moths lay eggs which, when they hatch out into caterpillars, may do a great deal of harm to trees and plants. There is another creature, not beautiful to look at, which never does any harm at all, but only good, to the plants we like to grow. We will hear his story with that of two other of our humble helpers.



TOADS, BATS AND OWLS

THE world is so full of friendly helpers that we have only to look about us with wide-open eyes and loving hearts to find a friend in almost everything God has created. Suppose we listen to a story of what some of these little creatures, those that we are apt to think unattractive and disagreeable, do to help the world and so to help us.

You know the common toad, — the funny, fat hop-toad that hops clumsily along the sidewalk at night, or just sits in your garden and blinks his eyes. He seems to do nothing but blink his eyes at you and breathe with long breaths that make his throat puff out as if he had swallowed too large a mouthful. He seems so fat and lazy! But he is not lazy, and if he is fat it is only because he is taking such good care of your garden. For he eats the little insects that are bent upon eating your flowers. Did you know that during those summer nights when you were sleeping the toad was helping you? He lives in the garden during the daytime, but you seldom see him because he hides himself in a hole. He makes this hole in the oddest way, kicking backwards with his hind legs and burrowing with his body as he goes. At dusk he comes out of his hiding place and sits down near the edge of the garden waiting for some insect to come by. That is the way of the spider, also. She sits and

waits, too, but she weaves a silken web to catch passing insects, while the toad catches them on the end of his tongue.

Of course this tongue of Lis is not like ours. It lies in his mouth just the other way around from the way ours does. The tip of his tongue lies near his throat and the root is fastened to the front of the lower jaw.

Now when he catches a fly, he does not have to leap upon it the way pussy catches a mouse. He just sits still, and when it comes near he shoots out his tongue, and before you can see what has happened the fly is swallowed. The fat, lazy toad, that seems to know only enough to blink his eyes, is so marvelously quick with his tongue that our eyes cannot see what he does. You would not think that of him, would you, when he seems so lazy?

But he is not lazy any more than the spider is. If he hopped about the garden all the time he would scare away all the insects. Then he would go hungry and the insects would grow fat eating our pretty flowers. So it is better for us that the toad sits still and lets the insects come to him.

These toads know more than we think. They naturally live in gardens, but they have found out that insects of all kinds are bewitched to fly about the street lights. So over to the street lights they go, too, and, sitting quietly under the light, make themselves look like stones or lumps of earth.

There, while they seem to be only waiting, they are having a continuous feast of insects, big and little. You seldom see them move; and you never see that lightning-like tongue go out. All you see is, that the

instant an insect alights or falls near the toad it is gone as if by magic, and that the toad sits there swallowing something.

While the toad sits so quietly under the light catching the insects that come near him, another little night-hunter is busy flying round and round the light, swallowing whole mouthfuls of insects as he goes. He is an odd-looking fellow. He has wings and he seems to fly like a bird. Yet he is not a bird for he has no feathers upon his wings or his body. His wings are very long and narrow and he scarcely seems to move them as he goes around in swift circles. His body is thick and short. It is covered with soft, silky, olive-brown fur like that of a mouse. His tiny face looks almost like that of a fox, with its bright eyes and long, erect ears. His mouth, which he holds open, is full of sharp teeth.

The English call this little night creature a "flitter-mouse," but "the little brown bat" is our name for it.

Have any of you ever seen a bat? Have you stroked its soft, silky fur, looked at its bright eyes, its snub nose and funny ears?

These little bats sleep during the day as the toads do, only instead of digging themselves backwards into a hole for their nap, they hang themselves upside down by their feet in some dark place. They like to hang under bridges or in the lofts of barns or even in chimneys. Sometimes they come down the chimney and fly about the room.

The best place to see bats is near an electric street light. We could almost call it a Maypole dance of little creatures that goes on during warm June and

July nights. Around the light, whirling and darting, go the large, beautiful moths, the smaller moths, the June bugs, mosquitoes, gnats and countless other insects. Sometimes they are dazed by the bright light or are overcome by the heat so that they fall to the ground, and the toads' tongues quickly catch them. All the while up above, gliding around the pole, in smooth, even circles, go the bats. They fly very swiftly with their mouths wide open, scooping up whole mouthfuls of the bewitched insects.

These bats are very cunning to look at and they can be tamed and made into interesting pets. So can the toad, for that matter. Both, we are told, will well repay the time it takes to tame them.

But it is not as pets, it is as little helpers that we value both the toad and the bat. They take care of the insects for us at night as the birds do by day. Indeed, we little know how many troubles we might have if the birds, the toads, the bats and the spiders did not help us by eating up just as many insects as they could catch.

Another of our helpers is the owl. He is a strange bird, with face and sometimes ears shaped rather like a cat's and with great, round eyes and a funny beak like a Roman nose. You have all seen pictures of owls, even if you have never seen a real one, so you know what a wise, thoughtful look they have. People often say, "You look as wise as an owl" when any one sits thinking with his eyes wide open. And the owls surely do look wise as they sit upon a branch of a tree and look at you so gravely.

The owls, too, are night creatures and sleep by



day. Their nest is in a hollow tree, but they often sleep upon a branch outside the nest where it is shaded from the light. When dusk comes they slowly wake up and then begins their night work. With their great eyes wide open they can see anything that moves, and with swift and noiseless flight they pounce upon the unsuspecting mouse or mole.

How do you suppose they ever see from their perches in the trees, a small gray mouse stealing along over the ground on a dark night, or the dirt-colored mole that lives mostly underground and comes up only for a short time?

Dogs hunt at night, but they run along the ground and their sense of smell is so keen that they can follow their game by the scent. But the owls see their prey, even the mouse and the mole, the color of both of which is so like the soft gray night.

The cat has eyes like the owl's, so it, too, can see quite clearly when it seems very dark to us. The pupils of their eyes are so large that they receive rays of light that never could reach our eyes. We have to feel our way very carefully on a dark night, but they can not only see where they are going quite well but they also see those small, soft gray animals.

The cat will creep noiselessly along, and then pounce upon the mouse, catching it every time. Her feet seem shod with velvet and her fur is very soft, so she slips along too quietly for even the timid mouse to hear her.

Just so with the owl. He has no velvet shoes on his feet, but he does not need them for he goes

through the air on his wings. The wings of birds usually make a noise; but the owl's wings are covered with the softest and thickest of feathers and the air that would make a noise striking against the hard wing of the crow goes softly in among these thick, downy feathers. So the owl can swoop noiselessly down upon the out-of-door mouse nibbling the farmer's grain, as the cat steals noiselessly upon the indoor mouse nibbling in the pantry. Both can see their prey and catch it quickly.

Besides catching mice and moles, the owls eat many insects. They seem very fond of cut-worms, those destructive cut-worms that live under the roots of plants and come up during the night and cut the whole plant off at the surface of the ground.

Isn't that a mischievous thing for these cut-worms to do? They are most apt to cut tomato plants, squashes and cucumbers. They do not even eat up what they destroy, but only nibble off the stalks of the young plants. Then on they go to others, leaving those cut to wilt and die. It is fortunate for us that owls will eat the cut-worms, for we find it very hard to catch them. They hide away during the day in burrows where we might not find them, and of course we could not spend the time going about all night with a lantern just to catch and to kill those mischievous little cut-worms.

The owls attend to that. They are great friends of the farmer. If the farmer had been more friendly to the owl, there would be many more of them than there are, and fewer cut-worms to injure his crops.

When the farmer ignorantly shoots the owls, then

the mice, the moles and the cut-worms increase on his land. They eat the food he has planted for himself and they cause him much trouble. Yet he has foolishly killed the owl before finding out what its special work is, and whether it is harmful or helpful to him.

If we ignorantly interfere with God's plans we must suffer. For God's laws are right. By them He has made and still makes the world. We are His people, and we must help Him as do the rest of the things He has created.

LESSON 13

HUMBLE HELPERS

MEMORY VERSE

He prayeth best who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all.

Coleridge

The Purpose

This lesson is a continuation of Lesson 12 and gives the children a further insight into the working of the Divine laws.

It serves to show them that the world was made for all, not for a few. One animal or species of animal cannot live to the detriment of the rest. Neither can different species be wholly exterminated without disturbing the balance of the whole.

Suggestions for the Teacher

The story of the earthworm is given here to show the children how great a work such a lowly creature is able to perform. Interest should also be awakened in this often-scorned little creature by pointing out the fact that it is quite wonderfully organized.

Knowledge of the earthworm's usefulness may do more to open the children's minds to the realization of God's presence in the world than stories of the intelligence and usefulness of the animals which seem to them more important.



Try to make a vivid picture of the ants and the aphids, the corn and the lady-bugs, as these stories illustrate well the balance of nature.

Review the memory verse for the last lesson, as it applies to this one also. Then read the lines chosen for this lesson, which the children will learn readily and gladly.

OPENING TALK

Would you like to know all that goes on in the animal world at night while you are asleep? There are such busy workers everywhere, helping to make and keep our world fit for us to live in. And the very humblest of all our helpers do a most important work and help to keep the balance of nature.

HUMBLE HELPERS

THERE is another little creature that comes above ground at night and stays under ground all day, unless the rain drives it out of its burrow, or we dig it up. It is a very humble little animal and many foolish people dislike extremely to touch it. But the earthworm is perfectly harmless and very clean. Moreover, it is one of the greatest little helpers that ever a farmer had.

The greatest scientist, Darwin, has said, "It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly-organized creatures."

The earthworm is like a tiny plowman, continually working over and enriching the soil in our gardens, under our lawns and in our moist pastures and farm lands.

How do you suppose this tiny plowman goes to work to turn over the soil? All we ever see it do when we dig it up is to hide quickly, burrowing its way out of sight. Yet that is just the way this little plowman does its work, by burrowing under the surface of the ground.

The earthworm makes a long hole or burrow a foot and more in length, deep into the ground. As it burrows, it eats the earth. In its tiny gizzard the

particles of earth are ground up into a fine, rich soil. This is mixed with certain salts of lime which are furnished from the worm's digestive organs. Then it is all cast out by the worm upon the surface of the ground above its burrow. You must have seen those little lumps of fine soil over the lawn and in your garden.

When you were helping weed the garden, did you ever see ends of grass and pieces of leaves half pushed into little holes? The earthworm gathered those the night before and pulled them into the mouth of its burrow to shut it up safely. It is going to eat some of the bits of leaves and will line the upper part of the burrow with the rest, if, indeed, you do not pull them all up to make your garden look tidier, as some people do. It is much better to leave them there for little Mr. Plowman to use to fertilize your garden.

As you shall learn in another lesson it is grass and leaves and other vegetation accumulating year after year that makes the soil in your gardens so different from that in a sand pit or a gravel bank. Although each worm pulls underground such a very little bit of grass and leaves each night, yet, as many, many thousands of worms work continually night after night and year after year, you can imagine how much good they do. Busy little plowmen they are, making the finest and richest of soil right there near the surface where you need it most.

The farmer plows and harrows and cultivates the soil on his farm and adds, to enrich it, those same salts of lime which the earthworm adds. With great labor the farmer can take away the larger stones and even

many of the smaller ones, but he cannot make the earth itself any finer.

And do you know, the earthworm is not so different from other animals, for all its shapelessness. It has a gizzard much like the one cook takes from your Thanksgiving turkey, only the earthworm's gizzard is very, very tiny. It has a heart and a stomach, a brain and a nervous system. Although it has no real legs or feet, all along on either side of its body are pairs of bristles, so small that they cannot be seen without a magnifying glass. These serve as legs to the earthworm, and help it to make its way over the ground.

Who would have thought that an earthworm was made with such care! It seems so simple and common a creature to us. Just a worm! And yet in that plain-looking little body a heart beats and red blood flows. God made the earthworm and gave it, small and shapeless as it seems to be, very important work to do. It is His servant, and one of our helpers.

There are so many friendly little helpers that I never could tell you about them all. But some of them are so interesting that you must hear about what they do.

Do you remember the name of those very small, green flies that the ants milk as cows? Yes, aphids is the name. They live on the underside of leaves and on green stems. You remember, too, that the ants sometimes take the aphids away from the shrubs where they find them, and put them on other plants with juicier leaves so they will give more honey-dew.

Now in some places there is a family of aphids that is very fond of the juice that they suck from the

roots of the corn, and there is a certain family of ants that live in those corn fields. Perhaps the ants live there to be near their cows, — who knows? However that may be, they attend to these cows with great care, for in the autumn they go around and gather up the tiny eggs which the mother aphids have laid in the ground to hatch out the next spring. The ants know that the eggs are not safe over winter in the ground and that the cold weather will destroy almost all of them; so into their cities they carry the eggs and store them all along their tunnels and corridors.

When the first warm days of spring come the eggs hatch. Then the ants take out the young aphids and place them upon the roots of the first little plants that come up in the cornfield. But after the corn is up what do the ants do but pick them up once more and, carrying them to the corn plants, put them safely into the tunnels which they have dug for them along the young roots.

All this helps the ants, of course. It is fine for them and for the aphids. The aphids are, without any trouble on their part, transplanted to a land of plenty, while the ant has an abundance of the most delicious honey-dew. But how about the farmer and the corn? The farmer planted that corn for himself, not for the ants and the aphids. He tends it with great care so it will bear fine, juicy ears of sweet corn for him, or firm yellow ears for his poultry and cattle. If the aphids are on the corn they will suck juice out of the roots. Then the leaves will not have juice enough to make over into sap.

You know what happens when the leaves cannot


do their work and provide the plant with sap. The plant will die. Even if there are some leaves still at work so the plant does not die, yet the corn upon the ear will not be good because it needs all the moisture that the roots can drink in and the leaves manufacture into sap.

What, then, can the poor farmer do? He has planted the corn with great care and has spent so much time hoeing it and tending it, and then, alas! those mites of ants turn it into a pasture for their tiny cows. And those same tiny creatures increase so fast that the poor farmer is quite distressed.

But there is a friendly helper about, and the farmer does not often lose his corn because of the ants and aphids. That is not the way God has planned the world, for a few to have everything. That is selfishness, and selfishness breaks God's law.

Now, what do you think is there in the cornfield ready to help the farmer? I do not believe you can ever guess, so I will tell you. Young lady-bugs! They crawl down among the roots of the corn and eat up a great many of the ants' cows, but they save the corn. Did you suppose that the lady-bugs that crawl up and down your window-sashes in the winter and early spring are some of the best friends that a farmer has?

It seems as if they did nothing. But it is just as it was with the toad. They may seem to be doing nothing when they are on your window in the winter, but in the spring and summer, when the aphids are eating the farmer's corn and fruit, the lady-bugs are busy enough. Those that we see in our windows are so



pretty, too, in their glossy red coats, each side so evenly spotted with little black dots, that you never could mistake them for any other bug or beetle. If you are careful of them through the winter they will fly out of the window in the spring and away they will go to the cornfields, the fruit trees and the rose bushes. For the aphids are very fond of the leaves of all of these. Next summer watch the rose bushes and the nasturtiums, and see if some ants will not come and milk their little cows while you are watching. Look ever so carefully and you will see the ants crawl up the stem, stroke the aphids with their antennæ, and drink up the tiny drops of honey-dew.

So whenever you find a lady-bug in the house in the spring and summer, pick it up very carefully and take it to the nearest rose bush or nasturtium or apple tree or cornstalk. That is the way good farmers do.

Throughout all the world there are insects and animals which do great service by preventing other creatures from selfishly taking everything. The birds keep caterpillars from eating all the leaves of the trees; the toads and bats and spiders eat up many of the flies and mosquitoes and troublesome moths; while the woodpecker finds the borers which are hurting the trees by boring under the bark.

Helpers are everywhere. We do not have to work alone. Indeed, nothing in the world has to work alone if it is working according to God's law.

LESSON 14

THE BIRDS

MEMORY VERSE

Behold, my servants shall sing for joy of heart.

Is. 65: 14

The Purpose

Birds are among the most friendly and interesting of our neighbors, and they give us further evidence of the unity of all life. The birds are useful to man in much the same way as the bat and the toad are, but they add another quality, an element of beauty and art that gives joy to the world.

Joy of heart is a Christian virtue which is not enough appreciated. The lesson on the birds has been used to show the happiness which this joyous nature brings to the world.

It is this quality which children bestow in greatest measure. This lesson may help them to realize what a gift they have; to cultivate that gift, and to be, in just this year of their lives, among those servants of God who sing for joy of heart.

Suggestions for the Teacher

Children see so much of birds and are taught so much about them in the schools, that this lesson is designed rather more to show the nature of birds than to describe their habits.

Their loving nature, their usefulness in ridding the world of pests, and the joyous songs which brighten our lives, are the points upon which we ought to dwell.

Urge the children to watch the birds at nesting time, and to do all they can to guard the nests. As this lesson may be taught after the bird migration to the south, it will be well to speak of the birds which stay in your locality all winter and what care boys and girls may give them at that season in providing sheltered feeding places.

Much added teaching material may be secured if desired. Colored pictures of birds and their nests will be found in any public library, and excellent leaflets, each containing a colored print and description of a bird, may be secured from the Audubon Society at three cents each. All material chosen should be used to illustrate and lead up to the lesson climax, the gift to the world which the joyous heart makes.

Hand Work

The children should make three lists on the page of the leaflet: one list of the birds they have seen and know, one of the birds whose songs they have heard, and one of the nests they have seen.

OPENING TALK

We have studied about one bird already; which one was it? Yes, the owl. What good thing does the owl do for the world? Have you ever heard his call? It is a queer "Hoot! hoot!" Much as the owl does for us, he cannot make us glad in the way some of the other birds do. For they give to the world their songs, which add so much to the joy of springtime. Our story to-day will tell us about the singing birds.

THE BIRDS

WHAT curious ways insects and animals have of making their homes and of taking care of themselves. Ants, earthworms, toads, spiders and bees all build tunnels, houses or cities in different ways and for different purposes.

The birds build houses, also, but they are quite different from the houses that these other creatures build. They are nests, all woven from material that the birds find, not from material that they make themselves. And these nests are really cradles, meant for the eggs and for the baby birds, not as homes for the father and mother, for after the little birds have grown large enough to fly, the nest is seldom used again.

In the spring, when the birds have come back to us, they choose a place for the nest, and begin to hunt about for the material with which to build it. The chipping sparrows find horse-hairs; the crows get small sticks; the humming-birds strip off from the baby ferns their soft brown winter blankets; the robins use dry grass and mud; and the orioles find string.

What sharp eyes the chipping-sparrow must have to be able to find the horse-hairs which it weaves into its small, well-made nest. You would need sharper eyes than the chipping-sparrow's and the greatest of patience to see the nest made. For the chipping-sparrows are very shy and would not let

you come anywhere near them. You cannot watch them from your window, for they always choose a leafy bower in which to build. The leaves make a nice roof to keep the rain away from their babies and also a screen to keep away prying eyes.

The Baltimore oriole hangs its woven nest from the drooping ends of branches in a place that seems quite perilous. Yet it is really very safe, for scarcely an enemy can reach it, and even severe winter storms do not tear it down. How prettily it is made of the milk-weed fiber, with string looped through and through it. And how warm and soft it is inside where the baby orioles will soon hatch out of the little eggs.

Robins are not such careful builders as the orioles and the chipping-sparrows, and their nests are not so pretty. They make the outside of dry grass and straw, then plaster it with mud. But the inside is all lined with horse-hair and it is smooth and soft.

Neither are the robins as timid as the chipping-sparrows. They often come and build upon your piazza. They will even make the nest while you sit there, if you are very quiet. But you must be intent upon your own work and not curious about theirs or they will fly away with the pieces of straw, or they may hop about the lawn scolding you until you stop looking at them. Then they will come so silently, with the bits of straw and the mouthfuls of mud, and directly before you they will make their nest without your being able to tell how they do it; for if you watch them, away they fly.


Birds are not so very unlike us, are they? For it often distresses us to be watched too closely while

we work. They are, in fact, like us in many ways,—these little birds that look so different. The father and mother birds love each other, and wait upon each other and work together to take care of their babies as our own fathers and mothers do.

After the nest has been built and the eggs laid, and the mother bird is sitting upon them, the father bird feeds her and sings to her. When she leaves the nest, he sometimes takes her place so the eggs will not become cold. After the eggs have hatched both the father and the mother bird work all day to find food enough for their hungry children.

Who has seen four baby robins reaching out of the nest their great wide-open mouths? At first it seems as if there was nothing but mouths until you see the queer, featherless bodies. They are hungry all the time. No matter how often father or mother robin comes with a worm, the baby robins still clamor for more. But they grow fast, and soon the down on their bodies is replaced by feathers.

The next time a robin alights on the lawn, watch him and see if he is not trying to catch worms. His eyes are so sharp that he can see the slightest movement of the earth above a worm where it is working in its tunnel under ground. He hops about and turns his head this way and that. Then, suddenly, down goes the robin's beak and up comes the earthworm. Very slowly the earthworm comes out of the ground. It holds on to the earth with the different rings or segments of its body, trying so hard to keep itself down in the ground. But the robin is the stronger, and bracing himself with his



feet, he steadily pulls up the worm and is off to the nest to feed his hungry babies.

Robins eat many other worms and insects, but they never catch them in the air or pick them from the trees as do some of the other birds. They get them all from the ground.

Did you ever see a Baltimore oriole flashing his gorgeous black and gold coat through the pink and white mass of a blossoming apple tree, while he pecked here and there and everywhere among the blossoms to catch harmful, hiding insects, and singing his clear note as he went? He is feeding himself then, because his nest is not finished in apple blossom time, but when the nest is ready and the baby orioles are hatched, he is just as good a hunter. Indeed, there are two hunters, then, for each nest, and a hard time they have filling those hungry mouths.

It is very fortunate for us that the baby birds are so hungry, for they eat a great many of the caterpillars and insects just at the time when the leaves are tender. If it were not for the birds the leaves on many of our trees and plants would all be eaten. Then the trees and plants would die.

All the time the baby birds are in the nest the father and mother birds watch over them with loving care and devotion. They bring them food; they keep the nest clean and dry, sheltering the birdies with their own wings and bodies from the cold and wet. If any of the little ones are too ambitious and try to get out of the nest before their wings are ready for flying, father and mother have a great deal to say about it. You can often hear them

scolding the too ambitious ones, for they know well that if one of the baby birds tries to fly before his wings are strong enough he will fall to the ground. The parent birds could not pick him up and put him safely back into the nest. The little bird might die of cold before his wings became strong enough to carry him to a safe place, and then, too, the cat might catch him.

When the time to fly does come there is great excitement. Father and mother coax and call and fly back and forth between a nearby branch and the nest to show their timid birdlings how it is done and to encourage them to try. The great eagles who build nests high up in the crags often fly just under their young to bear them up in case they should fall.

When at last the baby bird ventures off the edge of the nest and half flies down to the ground, the parent birds coax and chatter until he flutters up to a safe place on a shrub, where he may take a long rest. Then the other nestlings follow, one at a time, in the same way. The parents feed the little ones for days after they come from the nest, trying all the while with chirpings and twitterings and sharp calls to teach the little birds how to feed themselves and how to avoid danger.

Did you know before that birds had to bring up their children? And did you think that much of the noise you hear in the trees and shrubs is the warning that a too-venturesome little bird is having from his parents? Our own fathers and mothers could not have more to say to their children than these little bird fathers and mothers say to theirs.

But birds use their voices for something more than to scold and advise their children. The throat of the song bird is like a little music box from which the sweetest songs pour forth; songs that help make the world a happier place in which to live.

It is just at the time when they are building their nests and having their busy life together with their little ones that the birds sing. Is it not a lovely thing that each day they greet the morning with a song? It almost seems, does it not, as if they were thanking their Maker for this beautiful world and for the joy of being together and of serving the little, helpless birdlings they work so hard to feed. St. Francis of Assisi, a monk who lived in the thirteenth century, thought so; and because his heart was so thankful for all his blessings that he, too, longed to sing his thanks and praise, he called the birds his little brothers and sisters.

Two things that are a genuine service the birds do for us. They rid our gardens and orchards of pests that would destroy them, and they bring us cheer with their wonderful melody. Their music is one of God's gifts to us, a gift of joy and delight, for which, with the other wonderful things in the world, our hearts may give thanks. Victor Hugo, the great French poet, tells us to "be like the bird," for then we too may bless the world with a gift of gladness. These dear little servants of God show us, who are His servants too, how to keep a heart of joy while we do our tasks. They, above all His creatures, help us to understand the words of the prophet Isaiah: "Behold, my servants shall sing for joy of heart."

LESSON 15

ANIMAL FRIENDS

MEMORY VERSE

Trust in the living God, who giveth us richly all things to enjoy.
1 Tim. 6 : 17

The Purpose

While the activities of the insects and smaller animals described in the preceding lessons have been used to show the work that they do to help make the world a home for all, this lesson is used to show the direct benefit which the domestic animals are to mankind.

By using the gift God has given him of taming and training these higher animals, man has been able to become a more important factor in the progress of the world.

Suggestions for the Teacher

In telling the children about the usefulness of the domestic animals, bring out the special gift that God has given man, whereby he has been able to discover various uses to which these animals could be put as well as to train them for these uses.

Lay stress, also, upon the ability of the animals to adapt themselves to their environment. This characteristic is especially serviceable to man, as it is by the help of these animals that he has been able to live in many places where otherwise he could hardly survive, certainly could not improve his condition.

Show also that, as we have taken these animals from their wild environment, where they were free, to help us, we owe them the kindness and protection that we have taught them to need.

Hand Work

The children are to make a list of all the animals that are man's friends and tell how they are useful.

OPENING TALK

Do you remember the story of St. Francis and the wolf of Gubbio?¹ What did this same St. Francis call the birds? He was a friend to animals, and they were his friends, too, as they may be ours. Some of man's best friends are his helpers among the animals. When we think what they have done for him I am sure we shall want to trust more in the loving God who giveth us richly all things to enjoy.

¹ In *Living Together*, by Frances M. Dadmun, an earlier book in this course.

ANIMAL FRIENDS

AMONG all the animals that have proved themselves friendly helpers, there are none so friendly or so helpful as those that live with us. Those domestic animals, as we call them, were once as wild as the wolf, or the buffalo, or the mountain goat. They have become our friends and our servants because of the long ages of care and training that man has given them.

No one knows when first the dog lost his wild, wolfish nature, and became man's friend. Even when men were so wild themselves that they lived in caves, they had dogs living with them in the friendly way that ours do now.

As long ago as the time of Abraham, shepherds tended sheep in the pastures, and the wool upon the sheeps' back grew long and soft enough to spin and to weave into woolen cloth. When the sheep were wild animals they had no such wool. Then it was short and stiff and coarse, wholly unfit for spinning into threads long enough to weave into cloth. The skins of the wild sheep furnished men with clothing then, and it was not until they had been taken care of for a long, long time that the wool began to be fine enough and long enough to use for weaving.

Sheep and goats have always been among those animals which are most useful to man, for they need very little care and give great return. Sheep can live

comfortably upon whatever grass or small plants and leaves they find in rocky, hilly pastures, — places where cattle and horses could not live. In Scotland sheep graze in such rocky country that the shepherd himself cannot follow them; he has to depend upon the sheep dog to gather the sheep and bring them into the fold.

Goats not only furnish hair for cloth and their flesh for food, but they also give milk as cows do. Our cows need special care and food of fresh grass and hay if they are to give us good milk, but goats need little food, and that is of the simplest kind that scarcely any other animal would eat. They eat such strange things for food that people even joke about their living upon the old tin cans that are thrown about in uncared-for places.

In many parts of Europe and Asia people live upon the milk of the goat, and the butter and cheese which are made from it. These, with bread and a few onions, make the principal food of the poorer people of Italy.

The camel is another animal which men could not do without. Have you ever seen one? They are strange-looking creatures, surely, not nearly so attractive to us as our horses. Yet where the camels live the people love them as we do our pet horses, and in their eyes they seem quite as graceful. It is no wonder that they feel as they do toward their camels, for they are as useful as any creature that man has ever tamed. Long caravans of them travel across the great deserts and over the mountains in Asia and Africa, carrying merchandise from one place to another.

Like the goats, camels need very little to eat, and what they do eat no other creature seems to want. Old baskets and matting seem to give them as much pleasure as a bone gives a dog. Indeed, they are so fond of dry things that they will eat the thatch off the roofs of houses whenever they can reach it. In one place in Africa where the houses are made entirely of thatch supported by poles, a caravan of camels would eat the village up if the houses were not protected with vines bearing long, sharp thorns.

Perhaps you have already learned how one of the stomachs of the camel is fitted to retain much of the water that it drinks. If it were not for those small sacs which absorb the water from the stomach and keep it until it is needed, a camel could never go four or five days without a drink of water. More than that, the humps upon their backs are composed of fat, and these are gradually absorbed and used as nourishment if the camels are obliged to go long without food.

Is it any wonder, then, that camels are called "ships of the desert," when they are able to traverse those dry, sandy wastes laden with provision and merchandise for their masters, but needing very little provision for themselves?

The camel, too, gives milk, and from the long, silky hair which grows on parts of its body a very soft, warm cloth is made.

As it is with the plants and flowers, so it is with animals, — each kind is wonderfully adapted to live in the locality where it is found. The camel would



be quite out of place feeding in the pastures where our fine Jersey cows graze, while the cows could not give a drop of milk or even live if they had only the food the camel eats.

While the camel is so well fitted for traveling and carrying burdens in the land where he lives, the elephants are quite as well suited to be burden-bearers in the jungles of India and Africa. For they are so tall and so large that they can push their way through the thick mass of undergrowth, while their feet are so broad that they do not sink into the soft, wet earth.

Elephants are very intelligent animals and can be trained to do almost anything that their masters attempt to teach them. The trunk of the elephant is so made that with it he can lift large objects as easily as we do with our two arms, while smaller articles like pins can be picked up with the end of the trunks as easily as with our fingers.

Have you ever been to a circus and seen the remarkable tricks the performing elephants can do? Have you seen them sit at a table and eat, using napkins and dishes as nicely, almost, as we do?

While they have been trained to do many curious things, it is by the real work they do that we judge their intelligence. Elephants load and unload boats, build walls, and help ship-builders by dragging huge beams, for they can lift and drag with ease a beam which twenty men could carry only with great difficulty. Elephants are true workers, for after they have been trained to do a certain task, they keep right at it and work with a will. What is more,

they know the difference between shirking and being trustworthy.

Mary Howitt tells an interesting story of an elephant whose trade was wall building. He had been trained to lay a course of stone and then call the overseer to see that it was properly done before going on with the next course. This elephant did not have the patience of the orb-web spider. He seemed to get tired of building each course of stone so carefully, so he shirked on the last one. But he knew that his work was not good, and after he had made the sign that he was ready for the overseer, the sly, old fellow leaned against the part of the wall that was carelessly done so the man would not see it. When the overseer, however, commanded him to move, the elephant, knowing well that his poor work would be seen, without one word from the overseer pulled down the bad work and commenced to build it over again more carefully.

Strong as they are, elephants are also very gentle. The proboscis, or trunk, that can lift such huge burdens and strike such terrific blows, can be used as softly and carefully as a mother's arm. They love children, and are as tender with them and with the sick as human beings are. They have been known to lift children up and place them safely upon their backs or by the side of the road when they were in danger. And once when there was such a pestilence that the sick people even lay in the streets, the elephants in passing, without any word from their masters, would lift the sick ones and put them gently to one side.



Besides being very intelligent they have great memories, and are very affectionate. They have been known to remember people after years of separation, even recognizing grown persons whom they had loved as children.

Horses cannot work or carry loads by themselves as the elephants do, but they are very intelligent animals, and great workers.

Their memory is remarkable. They never forget persons who have been good to them, and they often remember quite as long those who have hurt or vexed them. A delicately bred horse is as sensitive as a person and cannot bear a sharp or harsh voice or rough ways. Such horses are trained by kindness.

Have you heard the story of how Alexander the Great, when a boy, was able to get control of the beautiful horse, Bucephalus, a horse which none of his father's trainers could mount? He did it by thoughtfulness and by kindness. Bucephalus, though a powerful horse, throwing from his back all those who had tried to mount him, recognized the loving strength of the boy and became Alexander's most faithful friend. For a faithful dog or horse or elephant is more than a servant, — it is a friend, loving with true devotion those who show it love and care and comradeship.

It is a marvelous gift which God has given us, — that of training animals and teaching them to do as we wish. Why do the animals obey us, do you suppose? Perhaps it is because they feel the love and interest that we give them; for if we start to train an animal we learn to love it. All animals know

when we love them. Even wild animals feel it. For there are great-hearted men, full of love for all God's creatures, who are able to go without harm into the thick mountain forests and the wildest country, places where most of us would not think it safe to go. In some way the wild animals know that these men will not harm them and they in turn do no harm.

Why should we not think of ourselves as the older brothers of the animals? Are we not all God's creatures? And should we not give love and care to those creatures which God has given to us to use and to enjoy?



LESSON 16

THE DOG

MEMORY VERSE

A friend loveth at all times.

Prov. 17: 17

The Purpose

Faithfulness is one of the important lessons that should be learned from the story of the dog. This animal has been so long a companion of man that he has acquired some very human traits. One of these seems to be the will to obey. Another is self-sacrificing love.

The noblest dogs are not servile creatures, obeying through fear. Their obedience, as their love, comes from a higher intelligence.

Suggestions for the Teacher

There are so many stories of the intelligence and faithfulness of dogs that the teacher will find it hard to confine the children to the lesson as given. They should be allowed to tell what they know about the intelligence and devotion of dogs, and the teacher should use the stories they tell to enforce the same lessons that are brought out here.

The love and sacrifice of the dog for his master ought to be made very impressive. It will help the children to catch a glimpse of what Dr. John Fiske called "the cosmic roots of love."

Hand Work

Each child is to write a short story of some dog that he knows or that he has heard about.

Ask the child to illustrate his story by pasting on a picture of a dog which he has found and cut out.

If the dog in the picture is the same kind as the dog in his story, so much the better.

OPENING TALK

What can you tell about some of our useful animals? Were they always tame and obedient?

Can you tell why the camel and the elephant are more adapted to some countries than the horse? How is the nature of a trained elephant different from that of a wild one? Tell about the trained elephants.

What is the nature of a finely bred horse?

If man has taken these animals away from their wild homes and made them dependent upon him for food and care, what do we owe them?

What do we owe to God in return for the special gift that He has given us of being able to take these wild animals and train them for our use?

We shall hear to-day about another of our animal friends, the one boys and girls know the best of all. It is the dog.

THE DOG

THE dog has been a friend of mankind for so long a time that we cannot think of men at all without him, and his attachment to people is so well known that he is called "man's faithful friend."

It means something to be called a faithful friend, does it not? You and I would like to feel that we deserved that name.

The Bible says, "A faithful friend loveth at all times." That is just the way a dog seems to love his master, — at all times. If his master is tired he will come and lie down beside him, as much as to say, "I will not disturb you, let us rest together." Or if his master should be sad or worried he will go to him, sit by him, or lean up against his knees, looking into his face with sad, sympathetic eyes. Indeed dogs are so sensitive that they can tell from a glance of their master's eyes, without a word being spoken, whether anything is wrong with him. If his master is sick or helpless, the true and faithful friend can hardly be taken from the one he loves so devotedly.


Have you read the story of "Grey-Friar's Bobby"? He was a little Skye terrier that followed his master to his grave, and would not be taken from it until he died himself. Terriers, they say, love their masters as much as that.

Newfoundland dogs love children, and will protect them from danger. Not only that, but the Newfoundland is so faithful that he will patiently bear being annoyed or even hurt by little children who know no better. There was once a Great Dane that was left to guard a baby sleeping in its carriage upon the piazza. A friendly dog came up and just peeped into the baby carriage out of curiosity. He meant no harm, but the Great Dane punished him severely for even going near the carriage.

Any good dog will give his life for his master, or for any of his master's family; and a reliable watchdog is as true to his post as a soldier. He will not leave it even if it should mean death to remain there.

Most of the dogs that we know are household pets, living in the house with the family and seeming like one of them. An intelligent and affectionate dog soon wins the love of every member of the household, and great is the sorrow if any harm should come to him.

But there are other dogs that are trained to do special work. Did you ever see a collie drive cows to pasture? It is very interesting to watch him. If a cow goes out of the road, the collie will nip at her hind legs, and back into the road she will go. He will bark behind the slow ones to make them go faster, and, running along by the side of the herd, nip, nip, he will go at the legs of any cow that strays out of line to get a mouthful of juicy grass or nice, tender leaves. A herd of cows with a well-trained collie to drive them will keep almost as even a line



as you children do when you are filing out of school.

All over Europe sheep are tended by the sheep-dogs. The master has only to speak or even look, and away the dog will run to gather in the sheep scattered over many miles of rough, hilly country. He will bring them all together in one place, *all*, for he does not miss a sheep. The shepherd himself could not do that. If it were not for those knowing, watchful sheep-dogs the shepherds would lose so many of their flock in the rough Highlands of Scotland that it would not pay to keep sheep there, although the country is wonderfully adapted for their grazing.

Then there are the dogs in Belgium, which have been trained to draw the two-wheeled carts in which the milk is carried to the cities from the farms. These dogs are strong and can draw quite a heavy load over the roughly paved streets. They start out early in the morning and often remain in town all day, lying down upon the ground to rest when the farmers' wives, who walk beside the carts, stop to sell the milk. The dogs of Belgium are as useful as horses, while they are cheaper to keep and much easier to care for.

The Eskimo dogs are like horses, too. In the far north they draw the sledges of the Eskimos. Six or eight of them are harnessed together in pairs, and over the rough or slippery ice they drag the sledges as no other animals could, for the pads on the bottom of their feet do not slip on the ice.

Those brave men who have been away off to the frozen north to try to discover the north pole, have

become very fond of their dogs, and have written much about their faithfulness. Lieutenant Peary, who after many attempts reached the north pole, tells how impossible it would have been for him to have accomplished his purpose if it had not been for the faithful, hardworking Eskimo dogs.

For many years men have been trying to find the south pole as well, but they could not travel very far on the ice without some animals to draw the sledges of provisions. There are no dogs living near the south pole like the Eskimo dogs of Greenland. One man, named Amundsen, thought that if he took some Eskimo dogs with him, they might be able to carry sledges with enough provisions on them to last while he made the long, long journey from the ship over the ice to the south pole. Sure enough, the dogs did the work; and because of their help in drawing the heavy loads of provisions Amundsen finally reached the south pole, and came back in safety.

So neither the north nor the south pole could have been reached if it had not been for the Eskimo dogs and their faithful endurance. They say that, "with the exception of the most intelligent horses and elephants, the dog is the only animal that takes a real interest and pleasure in his work. Whatever work he may be doing, he puts his heart into it."

Switzerland is the home of the St. Bernard dogs. Have you ever seen one of them? They are as large as a Shetland pony.

Near the top of a mountain called the Great St. Bernard is a place where men can cross over the

Alps from Switzerland to Italy. Such a place is called a pass. This pass of the Great St. Bernard is very dangerous. Before the tunnels were built through the Alps for the railroads, many persons were obliged to travel over this dangerous route. Not very far from the pass is a convent where good men live and to these good men the dogs belong. Their work is to rescue those who lose their way in the dangerous snow-storms, which are so frequent on the mountain passes. They know an hour before it begins that a storm is coming, and they are ready and eager to start out on their errands of mercy. One dog has a bottle of medicine attached to his collar and the other a large, warm cloak tied to his back. Because of the remarkable sense of smell that these dogs have, they are able to trace any man who has lost his way in the storm. After they have found the lost traveler, and he has helped himself to the medicine and put on the cloak, the dogs lead him to the convent, where he is well taken care of until the storm ceases.

If the poor traveler has become numb with the cold, or is buried in the snow, they will always find him and will stay by and bark constantly until they are heard at the convent. Then the good monks come out and carry the man to shelter. These dogs are so powerful that they can soon dig a man out of the snow even if he is deeply buried in it. For the wind blows and howls over those high mountain passes so fiercely that any one who falls from exhaustion is soon covered over with the whirling, blinding snow.

There was one celebrated dog of the Great St. Bernard pass that perished in one of those terrible storms. His name was Barry, and he wore a medal upon his collar, stating that he had saved forty lives. This dog wore no silver collar, as many English dogs do when they have saved a life, but he must have been just as proud of the medal, and I am sure he must have known why he wore it, — the brave dog!

Dogs are much like us in that they know when they have done well, or when they have done wrong, and they are as happy to be praised as a child, and just as ashamed when they are rebuked. Indeed, a dog is often very miserable when he knows that he has disobeyed. He will come to you with his tail down, slinking along in such a way that one has only to see him to cry out, "Oh, Peter has done something wrong, just look at him!"

He tries so hard to tell you that he is sorry and that he will not do so again. He is in truth a most disconsolate dog until you have said, "All right, Peter, be a good boy," — and then he is happy.

Isn't it odd, too, that dogs dislike to be laughed at? They know when they are objects of ridicule, and they do not like it any more than we do.

A dog responds quickly to the praise of his master or mistress, and will try very hard to deserve it. When he knows that he has done well, he walks along with his head up, his ears up, and his tail up, and he even lifts his feet up and steps proudly as he walks. But it is not for himself that he cares. If

he could talk he would not say, "I am glad I did this;" it would rather be, "How glad my master will be."

For the life of a faithful dog is bound up with his master's. He loves his master with such true devotion that his master's wishes are his first desire.

Would it not be worth while to try to be as faithful a little friend to those you love as the dog is, and as obedient?

LESSON 17

BEAVERS

MEMORY VERSE

None of us liveth to himself.

Rom. 14: 7

The Purpose

In this series of lessons a study of the activities and intelligence of the insects and smaller animals has been followed by a study of the almost-human nature of the domestic animals. The exceptional intelligence shown by the beaver, a shy creature of the wilds, living a life wholly apart from that of man, has been chosen for this last lesson in Part II. In it the child is taken back to nature again and shown an animal possessing much of the intelligence of the trained elephant, yet having had no association with man.

The child's mind, having been thus opened to the consciousness of the unity of life throughout nature, will be ready for the history of the world's growth, — the subject of the last half of the book.

Suggestions for the Teacher

The remarkable intelligence with which the beavers plan and carry on their work is worthy of a picturesque and understanding presentation. It would be well for the teacher to read one or more of the books about beavers in the list recommended (see p. xxi), in order to

have a broader knowledge of the subject than can possibly be given in the lesson story.

Lay special stress upon the fact that in just living his life and doing his own work the beaver is helping mankind, and so teaches us that in this world none lives to himself alone.

In later lessons the children will learn more about the importance of the beavers' work in changing the surface of the earth.

Hand Work

The pupils are to write answers to the questions on the leaflet.

OPENING TALK

We think the dog is intelligent because he lives with people. But there is an animal which can think and plan, and build houses and dams in a very wonderful way, that has never been taught by man. Do you know its name? Have you ever seen its house or dam? Suppose we hear the story of the beaver.

BEAVERS

You know what it means to be called as "industrious as an ant" or as "busy as a bee," but did you ever hear any one say this: "Oh, he works as hard as a beaver!"

Do you know what a beaver does? He is a builder and a wood chopper! He cuts down trees and uses them to build his house, also to construct dams across the rocky streams. Wouldn't you like to know what the beavers are like, and how they cut the trees, and how they make their houses and dams?

First, then, there are always a father and a mother beaver who leave the old pond and the old home and start out to build a new home for themselves and for their little ones. They sometimes travel long distances before they find a brook flowing through just such a place as would make them a good home.

You never would think to look at them that these beavers were so clever. They look like great overgrown muskrats and, indeed, they are something like muskrats, only they are much larger and much more intelligent. They have small heads, and bright little eyes, and large clumsy bodies covered with thick fur. Their hind legs are long and strong and end in webbed feet like those of a duck, for they are great swimmers; but their front legs are

quite short and the hand-like front paws are used to grasp and carry things. When they swim they use their broad, flat tails as rudders; when they fell a tree they use them as props to support their bodies during the hard work. But, strangest of all, they use them to warn the other beavers by slapping hard upon the water or upon the ground, in case of danger.

The beavers know that they must have certain things where they are to build their homes. There must be water and there must be plenty of trees with soft, juicy bark, such as aspens, alders and willows, for that is what they live upon, and of these they must cut enough to last them over the long winter. Wood must be used, too, for building the dam and the house. Then, these trees must grow near the water so they can be transported easily when cut; for the beavers can carry a heavy load when swimming in the water, but on land it would be quite a difficult task. Besides the kind and number of trees, and their nearness to water, the water itself must be a brook flowing through such a place that, when a dam is built across it, and the water is forced back, a pond will be formed.

Haven't you ever in your play built a dam of stones, or sticks and leaves, across some brook, and seen the small pond that is made by the water which cannot get over the dam? Did you know that almost all ponds and lakes are made because something has stopped the flow of the water of a stream? The beavers seem to know this, and they build dams so they can have a pond just where they want it,

and just as deep as they want it. Are they not clever little fellows?

Now this father and mother beaver, after they have selected with great care just the place that will make them and their children a good home, and have seen that there are plenty of the juicy-barked trees near by, set to work to dam the brook, build their house, and get in the winter's supply of food.

They begin by felling trees. Now a man with a sharp, steel axe to swing thinks he is working hard when he cuts down trees, but these beavers do not seem to get so tired. They work all night just as hard as they can, felling trees and cutting them up.

What do you suppose they use to cut the trees down? They use their teeth, their long, sharp front teeth! They sit down as a dog does, on their hind legs; they rest against their broad, flat tails, and, putting their forepaws against the tree, begin to gnaw it down, first turning the head to one side and then to the other. But instead of gnawing as a mouse gnaws, or as a horse eats his crib, these beavers take bites out of the tree with their sharp teeth, and leave the ground covered with chips, as a man does when he cuts down a tree with an axe. The beavers are only as large as a medium-sized dog. Think of a dog biting down a tree as thick through as his own body!

Sometimes the father and mother beaver work together, sitting on opposite sides of the tree, though more often each works on a different tree. When any one of the beavers feels that a tree is about to fall, he gives the ground a hard slap with his tail,



and all the beavers scamper away until the tree has fallen. Then they come back and begin to cut off the branches, if there is time before the day breaks, for it often takes all night to cut down the larger trees, those a foot in diameter. But whatever they do not finish before sunrise they are again hard at work upon by sunset, and all night long they work just as hard as they did the night before. If the little beavers are more than a year old they help, too, but felling the larger trees and dam-building seems to be the work of the father and mother beavers.

The branches of the trees they drag down to the stream. Then, taking the heavy end in their mouths and throwing the branched part over their shoulders, they swim to the place where they are to build the dam. There they place the branches side by side, and one above another, with the branched ends pointing down stream, because they know that the trees will be anchored better that way. Busily they work, and hard, carrying branches and smaller pieces of wood. When they have a firm, solidly built dam, they fill in the spaces with stones and mud. Down they dive to the bottom of the stream and up they come with their two hands full of mud, or with a large stone hugged up under their chins. The mud and stones they put into the holes, which they fill up tight.

Does not that seem like men? Even our dogs, much as they know, would not know enough to put mud and stones into a hole to keep the water from flowing through.

Some of the beavers are careful enough before

they begin to cut a tree to look up and see that the top is not entangled by other tree-tops, so it will fall easily when cut. And some of the older beavers are thoughtful enough to cut a tree so it will fall toward the water, for by falling in that direction it will make the distance less over which they must transport the wood.

You know that oftentimes your mother or father will say to you, "Why didn't you stop to think? You could have done that so much better if you had thought a moment before you did it."

It seems remarkable that these small animals apparently stop to think about their work, and to plan it, as men do. They have not been taught or trained by men, either, as our dogs and horses and elephants have been. For the beavers are wild animals. They have been trained by that "still small voice" which we name instinct, and, guided by that voice, they do what we would think impossible for an animal to do if we did not surely know that this building work was theirs.

After the dam has been made water-tight, the house must be built that is to be their home for the long winter. With this work the little beavers help. Back and forth they swim from the wood pile on the shore, carrying wood to the spot near the middle of the pond where they have chosen to build their house.

While some cut the juiciest trees into lengths one and a half to two feet long to be used as food for the winter, others take the longer sticks and poles and start to build the house. They go to work the way

an Indian starts to make a tepee. The poles are placed in a circle with their upper ends coming to a point. Then boughs are interlaced and heavier wood is put on until the outside of the house is so firmly built that a man could stand upon it. As soon as the pond begins to freeze over they plaster all the house on the outside with mud, which they bring up from the bottom of the pond in their "hands," and hugged against their breasts. When the mud freezes they have a house so strong that no hungry bear or wolf or coyote could tear it apart and hurt the beavers curled up inside.

After the outside has become firm and strong they gnaw out a large room inside, above the water line. One half is used for a bedroom and has the floor higher than the other part, so it will be well drained. They make their bed by tearing pieces of wood into thin strips like shavings. The other room, where they dry their fur and eat their food, has two holes in the floor which serve as their front and back doors; for the beavers always enter their houses by swimming under water and coming up through these holes in the floor.

The little beavers can help with the winter food supply while the father and mother build the house. They swim back and forth with the juicy-barked pieces of aspen or willow in their mouths, making long V-shaped ripples in the water behind them. If there is the slightest noise, down they go! If father beaver should slap the water with his tail all the beavers disappear so quickly and silently that it seems almost like magic.

The wood that is to be used as food is stored near the house under water, so they can get it even when the thick ice covers the pond and shuts the beaver family away from the world. With a strong dam and a strong house and a frozen-over pond they can spend the winter securely and keep warm and comfortable. They deserve a comfortable winter.—do they not? — after the hard work they have done to make their home secure.

In the spring after the ice has gone they often go to visit other beaver families in other ponds, but when July comes they hurry home to make everything strong again for the winter. Each little leak in the dam is patched and mended, and the house is newly plastered with mud and more wood is gathered for the next winter's food.

After some years the pond fills up and the beavers are obliged to leave that home and make another, for where the pond was is now a broad, flat meadow. The beavers have turned a mountain valley into a fertile field where cattle can graze and where men can plant grain.

St. Paul says, "No man liveth to himself." That means that we cannot do things without other people being helped or troubled by them. It is just as true with the animals. Their work helps more than just themselves. Our little brother, the beaver, is not only making a home for himself when he works so hard and skillfully at his building, he is doing his part toward perfecting God's plans for the up-building of the earth's surface.



PART III

The Earth Made Ready
for Man

LESSONS 18-29

Before beginning and without an end,
As space eternal, and as surety sure,
Is fixed a Power divine which moves to good,
 Only its laws endure.

It maketh and unmaketh, mending all;
What it hath wrought is better than hath been;
Slow grows the splendid pattern that it plans
 Its wistful hands between.

Sir Edwin Arnold



LESSON 18

AS IT WAS IN THE BEGINNING

MEMORY VERSE

In the beginning God created the heavens and the earth. And the earth was waste and void; and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters.

Gen. 1:1, 2.

The Purpose

The Lessons 18 to 29, inclusive, tell of the forces that have made our planet the wonderful world we know, and that are still at work, alike in organic and in inorganic nature, perfecting what has already been done. The purpose throughout is to show not only that there is change and growth, but that these are indications of that great watchful love and care which has so far been present and is still carrying creation on to even greater perfection.

The pupils should learn, as these lessons of beginnings are taught, that the same forces are still at work, that the Spirit of God still moves upon the waters. Then to his Bible verse which tells him what happened "in the beginning" he will learn to add: "From everlasting to everlasting God creates the heavens and the earth."

Suggestions for the Teacher

No attempt has been made in this lesson to account for the actual beginning of our planet. For our purpose the story may well begin after its position in the solar system has been established.

152 THE EARTH MADE READY FOR MAN

This first lesson has been told as simply as possible. Frequent appeals are made to the children's imagination. A vivid imagination in the teacher, together with an enthusiastic manner, as if telling a fairy tale, will be a great help. It would be advisable also for the teacher to have in the class a small globe. If the children can be helped to form vivid mental pictures of the world, the fog, the clouds, the rain and the great universal ocean, these lessons about the beginning should not lack interest for them.

The teacher should read carefully all the lessons in this section (18 to 29, inclusive) before trying to teach this one. If the mind has not grasped the picture of the changing world as a whole, one cannot so well teach it in part.

For further study the teacher is referred to Brigham's *Text Book of Geology*, D. Appleton & Co.

OPENING TALK

We have been studying about that part of our world which is close to us so that we can see it, — the clouds, the trees and shrubs, grasses and ferns, seeds and flowers; then about the animals that live upon the earth with us. Now we are going to think back, ages and ages, and try to see our world as it was in the beginning. Our Bible opens with words written about that beginning by people who lived very long ago. In its very first words it tells us such a wonderful truth that we must be sure never to forget it. I will read it to you, and then you may repeat it together. (Read and repeat the memory verse impressively and reverently.)

Now we will start with something that you have seen, something you know about, which will help you understand our world as it was in the beginning.

AS IT WAS IN THE BEGINNING

DID you ever watch men at work building a new house? You remember how the ground about the house looks while the building is going on. And after everything is finished and the house is ready to be lived in, how does the ground look then?

What have the workmen done to make that ground so even and so smooth where it was so rough before? Perhaps you may have stood and watched them when they cut away the rough places and filled in the hollows.

Did you ever wonder what the place looked like before your house was built there or before any of the houses were built that make up the city in which you live?

Do you suppose there were hills and valleys there, or was it all flat and even before the streets were made and the houses built? Was there a great forest covering the place long, long ago, or was it an open plain where the wind swept over the grass and the clouds played at hide and seek with their shadows through all the long August days?

When a new street is laid out and rows of houses are built on either side, the land covered by the street and the houses does not have the same surface that it did before anything was built there. For the people who do this work try to have everything

as level as possible. So they cut down the rising ground and fill up the hollow places and then the houses are built to stand in long even rows.

It is so when people make a city. We know, for example, something about what Boston looked like long ago before it became a city. When the Puritans came, there were three high hills so prominent that the first settlers called the place Tri-mountain, meaning "Three Hills."

Where are those three hills now? Two of them have been cut down so low that you could scarcely guess that they had ever been there. Beacon Hill, which is left, is very much lower than it was, and the Common, which was a valley sloping quickly down to the water's edge, has been filled in until the whole slope is very much less steep than it was. This is what men do to their cities because it is easier to live and work where the ground is fairly level.

But how about the world itself? Did you think that the open country, the fields, the hills and the brooks, have always looked as they do now? No, indeed! There was not always a meadow where the brook now winds its way, nor has the water in the brook always meandered as it does to-day. The broad, open fields have not always looked as they do now, nor has the hillside always been gently sloping. For nature herself has been doing to the whole surface of the earth, ever since the world began, just what men have been trying to do to those places where they build their cities.

Nature,—that means everything in the world

working together according to God's will. Everything working together! What a wonderful story it makes. Would you like to hear the story? Would you like to think away back to "once upon a time" and learn what the world was like before nature had made it as we see it to-day?

First, then, try to think how everything looks on a very foggy day, when the fog is so heavy that the sun is quite hidden and everything seems enveloped in a thick cloud.

There was a time, long ages ago, when there was a blanket of fog and mist surrounding the world, so thick that the sun was never able to shine through it. The earth was hot then, — very hot. There was never any winter, never any frost or snow or wind. There was no rain even, but just that heavy fog resting like a thick blanket upon the surface of the earth.

After a long, long time the world began to get cooler. Then the fog did not rest quite so closely or quite so heavily upon it. Once in a while the faintest glimmer of sunlight made its way through the mist. But almost always it rained, — a gentle, soft, oozy rain, as if the fog blanket were a sponge too full of water. This water fell on the hot earth.

Have you ever seen water fall upon a hot stove? As soon as the water touched the hot surface it disappeared so quickly in steam that there was not a drop of water left. But if the stove had been cold the water which fell upon it would have remained water, and perhaps some of it would have run off upon the floor, leaving the stove wet where it had been.

Now the water which escapes so quickly from the hot stove and disappears in the form of steam is not lost. It is held invisible in the air if the room is very warm, but where it touches anything cold it changes back to drops of water again.

Try, now, to imagine the hot earth, somewhat the shape of an orange, surrounded by the thick blanket of steaming fog, from which rain at last began to fall. The water thus falling would go hissing back into steam almost before it reached the earth's surface. Next, think of the earth as cooling gradually, until the drops of water which fell remained longer and longer upon its surface without going back into steam, until at last the earth became so cool that the water that fell upon it became great ponds and lakes.

How it rained in those days! It rained so hard and so long that the surface of the earth became all covered with water. There was one universal ocean with no land anywhere in sight.

For long, long ages this vast, encircling ocean covered the earth. Nothing could be seen but water and clouds and rain. But after those long, long ages had passed some land began to show above the water.

All this time there was nothing living upon the world, for it was not ready to nourish any form of life. The air then was heavy and thick: no one could have breathed it. The water was still warm and so full of mineral matter that we could not have lived at all if we had been obliged to drink it. The rocks, too, were strange rocks, with the minerals

which composed them arranged in such a way that they would not have been so useful to us as the rocks we have now.

But God was getting the world ready for us to live upon, and the constant rain was helping Him, as you shall hear in another story.

When the solid earth began to rise above the surface of the vast, surging ocean it began to look like a world. The rocks were like some that help to make our own country. In fact it *was* our own country of North America that first showed itself above the encircling waters.

So the world, our world as we find it now, was beginning to grow, and, although there was nothing alive anywhere even yet over its whole surface, the Spirit of God was moving over it. That Spirit was there then, just as it is here now. In obedience to His thought and His laws the world changed and grew until it was ready for life to appear.

Always from the beginning God has been with this wonderful world of ours. His Spirit it was that moved over and through and in it. He is with the world now, He has been with the world since its beginning, and He will be with the world forever.

LESSON 19

THE WORK OF THE RAIN

MEMORY VERSE

Behold, God is great, . . .
For he draweth up the drops of water,
Which distil in rain from the vapor thereof.

Job 36:26, 27 (R. V., Margin.)

The Purpose

This lesson, which carries on the story of the change and growth of our planet, is intended to show the enormous factor that rain-water has been, and still is, in shaping the surface of the earth.

The lesson to be taught is that great things can be accomplished by continuous effort made according to God's law. All these lessons should tend to increase the child's reverence for the earth on which he dwells and for its Creator. The memory verse will deepen the religious impression.

Suggestions for the Teacher

The story of the rain-drops can be made a most interesting one to the children because of the fairy-like quality that can be given to it.

Vividness in telling of the continuous journey and the changes in form will claim the interest of the children and give them a mental picture that they will not forget.

A lesson on habit should be drawn from the channels which the rain-water follows so easily after they are

once made. A good habit formed is as easy to follow as it is for the water to follow the channel it has cut. Why not form good habits, then, instead of bad ones?

Hand Work

The children are to watch for some cutting-work done by the rain and then write the account of it on the leaflet.

They are to fill the spaces in the sentences at the end of the blank space.

Assign for home reading the Bible passage about the weather, Matt. 16: 1-3.

OPENING TALK

Can you shut your eyes and see again the picture of our world as we tried to see it last Sunday? Tell me what you can see. Is it like this? At first, the round world, so covered by a thick blanket of fog that not a single ray of the sun could ever shine through upon its surface. Then, a globe covered with one vast surging ocean except for an island which shows above the water, and, surrounding the globe, thick clouds from which the rain fell continuously.

Now we want to know what it was that this falling rain did for our world.

THE WORK OF THE RAIN

Now although the rain as it fell upon the surface of the cooling world did not turn into steam and rise again into the enveloping fog, yet the water did not remain long where it fell. For water is always moving and always changing because of the forces that act upon it. That is its law.

Think about the water that you see falling as rain. Does it remain in one place very long? Down it comes, away it runs in a hundred little rills to the brooks; the brooks hurry it off to the river, where it flows a broad, silent stream to the ocean. Yet even in the restless ocean it does not remain long, for the sun coaxes it away.

The sun beams are warm; you know yourself how warm they are. When they rest upon the water those drops that are moving to and fro upon the surface of the ocean are taken up into the air that has been warmed by the sunbeams, and become invisible.

Did you ever watch the sidewalks dry off when the sun came out bright and hot after a summer shower? Did you ever wonder where the water went that dried up so quickly? It was going up unseen with the sunbeams, just as if it had put on an invisible cap and slipped away straight up those long, golden ladders. You and I cannot become invisible, but drops of water can when the sun touches them with

its long, golden rays. We call those invisible drops "vapor," and when water dries away from any surface we say that it "evaporates."

So the drops on the surfaces of the ocean and the ponds and rivers evaporate. They change into vapor and, leaving their companion drops, rise up into the air. They rise until they reach a place where they can stay comfortably and where many other drops in the form of vapor join them. We do not see them as they ascend, but when they stop and collect in one mass we can see them.

Who can tell what we call those masses of vaporized water-drops that are floating about in the sky? You have guessed it. They are clouds.

Did you know that those strange and beautiful clouds which you have watched and of which you have learned the names were formed in this way? Did you think that they were storehouses full of tiny beads of water which had risen unseen from the surface of the earth and ocean at the bidding of the sun?


Ah! would we not love to see those invisible drops as they rise from the earth and ocean and make their way up, up on those long, golden ladders into the sky? Sometimes when the sun is setting behind dark clouds we can see the long rays of the sun reaching down toward the earth. Some people say when they see this, "Look! the sun is drawing water." But the sun is always drawing water up into the air. Next time you see the long rays of the setting sun, think of the countless number of invisible drops that are traveling up those golden ladders into the sky.

Think, too, of the journeys those drops of water

take. They are no sooner formed into clouds than they are driven about through the air by the wind. In that journey, when they come to a place that is colder than the air in which they came to rest, it is as if the clouds were squeezed as you squeeze a wet sponge in your hand, for the colder air congeals the beads of vapor into drops of water again, and rain falls from the clouds. Sometimes it is a soft, gentle rain that only wets the grass and leaves and flowers. Sometimes it is a driving rain which comes in such heavy drops that it races away in streams and brooks. Sometimes it is snow, and sometimes hail.

What an endless task this seems! Is there anything on earth that could tell us more marvelous tales of travel and adventure than the drops of rain water? For water is continually in motion and endlessly at work. Water is one of God's most active helpers. Just picture to yourself its wonderful journey.

Up into the air it goes as vapor, keeping the air soft and moist all the while. Through the air it floats as clouds and, while it floats, it curtains off some of the sun's rays and keeps them from scorching the earth. To the earth it falls as rain, refreshing the plants as it falls and nourishing the roots as it sinks into the ground. To the surface again it comes in springs of fresh, clear water. And away it flows in brooks and rivers to join again the vast ocean, only to begin once more its long, changeful journey. Ever since the beginning, when the heavy, close-lying fog was raining itself away, water has been traveling like this. Only at first there was no land to travel over, and then for a long, long time there was nothing to



nourish as it fell, for nothing grew upon that first rocky surface.

But the thought of God was upon the world, and it was changing and growing. The peak of land which had first appeared grew larger and larger. Then more land arose from the sea, until in time a part of each of the six great continents that you see pictured upon the maps and the globe in the schoolroom had emerged from the ocean. The rocks that make up that land looked more like our rocks, and they were getting ready for something to grow upon them.

All this long, long time while the land was slowly rising from that vast ocean, the rain water was busy obeying God's law and fulfilling His purpose. For the rain worked to change the surface of the earth, and to make it a better home for the plants, the animals and the people that God willed should live upon it. The rain not only blesses the things and the creatures living upon the earth, but it helps and has always helped to change the solid ground and make it fit for them to live upon. Ever since the first crust of rocky land emerged from the vast, enveloping ocean even to this time the rain has worked in the same way.

Can you tell what the rain water does to change the surface of the earth? Do you remember what the men did when they laid out the streets and finished the ground around the houses? They evened the ground by cutting down the hills or ridges and by filling up the valleys and hollows.

In the same way the rain water is at work, cutting down the hills and filling up the valleys. Persistently

and endlessly it cuts down and makes even the surface of the earth.

Have you ever seen, after a hard rain-storm, how gullies had been worn in the road where the water ran off into the gutter? Sometimes the gullies are so small that you have to look closely to see them, but many of them are so large that they make deep cuts in the side of the road. Men come and mend the road, but unless they put a hard surface upon it those gullies will be made again and again whenever it rains very hard.

Do you know why? It is because the water is trying to make itself a channel so it can flow away faster to the deep sea, and although many of the drops sink into the ground or are taken back into the sky while on the way, yet most of them get to the ocean at last.

The raindrops seem so impatient to get there that they wait for nothing. They will hurry along the surface of the road and run off the side into the gutter. More drops join and follow the others, for drops of water like to be together. It is their nature, and they cannot work well alone. These drops make a continuous stream, trying to get down from the higher surface of the road. They push away the sand and gravel, then the little pebbles that are in their way, until they have cut a channel through which they can flow more swiftly and surely to the brooks and the rivers on lower ground.

If the road is not mended, when the next rain-storm comes the gully will be worn deeper until the rain water will have made a permanent channel for itself, through which in rainy weather it regularly flows from the surface to the gutter on its way to



join the brook. The rain wears not only one channel but several. If the road was never mended it would not be very long, a few years at most, before the rain water would have worn off the whole surface of the street in its hurry to get off to a lower place.

It is true that the rain makes the higher ground uneven at first; that is its way of working, for it can only do a little at a time. All that material, too, which it has worn out of the gullies must be carried away little by little. Even men cannot level off a hill all at once. They cut into the side, leaving a very jagged-looking place while they cart away the loose material, and that always takes time. Even with a steam shovel working all day with trains of cars to take away the gravel it takes a long time to cut down a hill. Think of the time, then, that it must take the rain water which can only work when it rains. For besides cutting down the raised surface it must take away the sand and pebbles that it loosens.

Is it any wonder, then, that it makes the higher ground more uneven in its first attempt to level it? In time, if no man interferes, the rain water will carry away the soil and pebbles from the higher places to the lower and leave the whole surface more even.

That is what it is doing to-day. That is what it has done for ages. That is what it commenced to do to the peaks of land as soon as they emerged from the vast, enveloping ocean.

Over and over again these raindrops do their work, as they have always done it. And all the while, as they have been fulfilling God's law for themselves, they have helped to make our great world more fit for life.

LESSON 20

THE WORK OF THE RAIN: BROOKS AND RIVERS

MEMORY VERSE

Thou shalt keep the commandments of the Lord thy God, to walk in his ways, and to fear him. For the Lord thy God bringeth thee into a good land, a land of brooks of water, of fountains and springs, flowing forth in valleys and hills.

Deut. 8: 6, 7.

The Purpose

This lesson deals with the tearing-down and building-up force of rain water as it flows off the earth in brooks and rivers. The general action is the same as that described in the previous lesson, except that in this case it is the larger forces in the brooks and rivers that are at work.

The commandments of the Lord for our lives are as definite and sure as those which direct the forces of the rain. Our task is to find out the law of God as it relates to our own lives, that we may do it.

Suggestions for the Teacher

A map of a water system like that of the Mississippi or the St. Lawrence will help the pupils to understand the way brooks and small streams join to make a great river. It should be used after, not before, the illustration of the fingers and the arm.

The teacher should have as specimens to show to the children an angular fragment of rock and a waterworn

pebble, and should make a special lesson from them as to the way nature rounds off sharp corners. Anything in us that hurts those about us is an angular corner which life seeks to wear down and make smooth. 'What is not corrected when we are young the world will correct in us later, and that causes us more pain.

The question given in the opening talk should be used in this form only if there has been opportunity for such observation during the week.

Hand Work

The children should be asked to draw a river system upon the last page of the leaflet.

OPENING TALK

Have you ever noticed the little gullies cut in the road by the rain water? Can you think what would happen if these kept getting larger and deeper as more water ran through them? That does happen in many parts of our earth, and you shall hear to-day more of the story of what the rain has done to our world.

THE WORK OF THE RAIN: BROOKS AND RIVERS

JUST as you see the rain water at work now upon the side of a road or on a gravel walk or any other surface that is not protected, so it began those long, long ages ago to work upon the crests of those rocky islands that have become the six great continents upon which people live.

Slowly at first it did this, very, very slowly, because there was nothing to work upon but rock. No gullies can be made in a single rain-storm on a surface of solid rock. How many, many years the rain must have fallen upon that rocky surface before it was able to wear the smallest depression in it! But in time even rock gives way to water, and finally those patient raindrops had their reward. The smallest depressions appeared. These became grooves, then were worn into channels. Thus, after years and years there were brooks flowing to the ocean in deep beds that they had hollowed out for themselves from the solid rock.

It seems almost impossible, does it not? But since God gave the rain water its work to do and its law to follow, would He not always give it power to do that work? Yet it seems as if nothing in all the world had a harder task than the rain water, for the wearing away of the hard rocks was not all it had to do. The raindrops must carry along with them

in their journey to the sea the small particles, the pebbles and the larger rocks that they had worn away or broken off.

It was not far to the sea at first, and the rain water ran merrily off the shoulders of the rocks into the surrounding ocean much the way water rolls off your umbrella. It was working hard, however, to take some little particles of rock with it, and these, washed about by the flowing water, helped it very much in wearing its channel.

As the land rose, and there was more surface for the rain to fall upon, the water gathered into these partly worn channels, making them deeper and deeper. Into them it would wash all the particles of rock which had been worn away or broken off, while along the bed of the channel it would push these rocks as it hurried on its way to the sea. All along the way the bits of rock would jostle and bump against each other, wearing down the bed of the brook and wearing off their own sharp corners. When they reached the sea they were no longer sharp and angular bits of rock, but smoothly rounded pebbles like those you find on the beaches to-day.


When you have played with those smooth, round pebbles on the seashore, did you ever think where they came from, and what made them so smooth and round? Did you suppose that they were always so? Oh, no. Once those pebbles were part of a great, solid rock. Perhaps some of them belonged to the cliffs farther off along the shore where the water pounds and foams all day and all night. Perhaps some of them came a long distance, brought by a

river many years ago from the place where the rushing mountain brook tore them away from their parent ledge.

In that long-ago time, just as now, not all of the pebbles in the rushing brooks reached the sea. Some were worn down almost to powder, like the sand and clay you play with on the beach or wade into at low tide. Some were left all along the way wherever the brooks or rivers flowed through a place low enough to be flooded over when the water was high; for after a hard rain the brooks did then exactly as they do now. They overflowed on the lower parts of their course and spread out in broad sheets of water where no water had been before. Then presently, when the rain was over, the waters subsided and flowed away in the regular brook channel. But although the water flowed away it did not leave the low land just as it was before, for there remained on its surface some of the gravel and sand that the stream was trying to carry away with it. This helped to fill up the valley. After years and years of being flooded the valley would be changed from a deep hollow into a more even plain.

The hollows were filled with the finely worn pieces of rock where roots could feel their way and plants could grow when the time was right. That is the way many of our meadows came to be as they are.

Now all along throughout the ages the streams have worked in the same way. If you could watch a rushing mountain brook you would see it doing the same thing now. Rapidly it pushes along the bits



of rock that are washed into it, wearing the rocks smaller while it wears its own bed deeper and deeper.

Sometimes when there is a very hard storm and the brooks and streams are full of rushing water, large rocks will be carried along for a great distance, and when the force of the water has lessened, the rocks will be left in the strangest places. We call it a flood when the water of a stream escapes from its banks and flows over the country, taking with it whatever lies in its path. You could hardly believe water could be so fierce and strong as it is when in flood.

It is not usually so strong as that, but in the mountain brooks, where the water runs very swiftly, it is always strong. If it were not so it would never be able to carry the rocks and pebbles down into the valley and to the river.

It takes many brooks to make a river. From the higher land and from the mountains the brooks come rushing and tumbling down into the valleys, then out of the valleys flow the rivers. All along on their way to the sea the rivers are joined by brooks and streams and by other rivers. That is why the river grows larger and deeper as it flows ever onward to its home in the ocean.

Suppose you hold up your hand with the fingers outspread, and make believe that each one of your fingers and your thumb is a brook flowing down off the mountain into a broad valley. That valley you can imagine the palm of your hand to be. Then out of the valley would flow a river which would grow larger and broader as it went to join the sea,

172 THE EARTH MADE READY FOR MAN

as your arm grows larger where it meets your body at the shoulder.

Now suppose you shut your eyes and try to see, not your hand and arm, but a long river flowing to the sea, ever growing broader and deeper as it flows along while it is fed continually by those swift mountain brooks.

Long, long ago, when the dry land was slowly emerging from the ocean, the streams went rushing to the sea almost as swiftly as the brooks rush off the mountains now, and the fragments which they were carrying along with them cut like a saw, deep into the hard rock of their beds. Just as jewelers cut and polish diamonds with diamond chips and diamond dust, the brooks and young rivers use the fragments they take away from the rocks to cut into and wear away the rock over which they flow.

It takes a long, long time. So many, many years of rain; so many, many years of water flowing off into brooks and then into rivers; so many, many years of the grinding and wearing of fragments! But those brooks and rivers have made over the surface of the earth. Things could grow upon it then; just the tiniest bits of lichen at first clinging to the rocks, then mosses and ferns, then trees, and at last animals, as you shall hear later.

During all this time the land was rising from the sea. How it did this is God's own secret. The rain water with the brooks and rivers helped to make more land, too, by depositing at the shore and in the ocean the great amount of sand and clay they car-

ried down from the heights. It all made great shelving beaches then, just as it does now.

Think of the patient working of these brooks and rivers. Think of the ages and ages that they have worked to make the world ready for life.

Even now they are still busy cutting down our mountains and filling up our valleys, although to us the world seems quite finished. They are God's helpers, as are we. Unless the raindrops and the brooks and the rivers had done God's work in those long-ago days, the earth would not have been made ready for us to live upon; and the work they do now keeps it fit for life.

LESSON 21

SNOW, ICE AND FROST

MEMORY VERSE

He giveth snow like wool;
He scattereth the hoar-frost like ashes.

Ps. 147: 16.

The Purpose

The different forms under which rain water works and the beauty of those forms is the subject of this lesson. The purpose is to teach the child to view the world with reverence. The beauty of the tiny snowflake, whenever seen, and the wonder it arouses, should bring God very near to the heart of the child.

Suggestions for the Teacher

This lesson gives the teacher an opportunity to call attention to the beauty and perfection in form of many of God's creations which are often unnoticed. The subject of the snowflakes may impress many lessons besides reverence, among them the obvious one of the results accomplished by the combined strength of seemingly weak things.

Hand Work

Ask to see the work on the last leaflet which was assigned as home work.

The passage on the last page of the leaflet is to be

completed by filling the blank spaces with the right words. This work makes an excellent test of the pupil's grasp of the lesson story.

OPENING TALK

Question the pupils as to what happens to the rain in winter. Will they mention all the forms named in the title of this lesson?

Review rapidly the work of the rain as given in the last two lessons, in preparation for this story of its work in the form of snow, ice and frost.

SNOW, ICE AND FROST

THERE are others of God's helpers that work with the rain-water in changing over the earth's surface. The wind helps. It drives the rain against the rocks and upon the ground, so that it strikes very much harder than it could by itself.

Did you ever come home from school when the wind drove the rain against you so hard that it went through your coat, and even spattered through your umbrella? Nothing can seem to keep dry in a driving rain. It gets under the shingles on our roofs, it works under the window sills, and it turns over and soaks the under side of the leaves, those poor leaves that cannot breathe if the little pores upon the under side are full of water. So when the wind dashes the rain against the side of a cliff it can wear away that cliff much faster than if it fell gently upon it.

The wind not only drives the rain, but it drives sand also. In the great Desert of Sahara and the Arabian desert the wind wears rocks away very fast by blowing sand against them. At the seashore in a terrible storm the wind blows the sand so hard against a rock or cliff that it cuts away the surface and polishes it smooth.

If you should ever go to Provincetown and Highland Light on Cape Cod, you should look carefully at the great cliffs under the lighthouse, and see how

the wind has cut and polished the hard pebbles held fast in the clay of which the cliff is made. Then you will know how terrible the force of the wind-driven sand must have been.

Many things we learn to do in a better way by watching nature and seeing how she works. A man once noticed the force with which the wind drove sand against a cliff, and he thought about it so much that he invented a new way to decorate glass. It is called engraving glass with a sand-blast. There is a pattern cut as you cut your pattern for stencil-work. Then the glass, excepting where the pattern is to be, is covered with wax, and a blast of air full of fine sand is blown against it. Wherever the sand touches the glass the surface is made rough and white, not transparent as it was before.

The wind helps, also, in blowing about the finer particles of sand and dust which have been worn from the rocks. You have already learned how it piles up heaps of sand along the shore and moves them almost as if they were marching. It does the same thing in the desert.


The rain has another helper in the cracks or fissures in the rocks themselves. For the rain is caught and held in these cracks; then comes the frost and freezes the water. You know that water frozen into ice takes up more room than it does as water. That is why tumblers are broken when water freezes solid in them. Ice breaks rock in the same way, making the fissure wider and deeper and splitting off many pieces from its sides. At the end of the winter you will often find these fragments of rock lying in a heap at the base of a ledge.

After a time soil collects in these fissures, some of it being blown in by the wind. This makes a home for the seeds and spores, which grow into graceful rock-ferns and beautiful nodding columbines. Many times trees start to grow in these fissures, and their roots grow and spread until they split the rocks apart. In time one part of the rock may even break entirely away from the other. It takes a long, long time for this to happen, for the growing roots work very slowly.

Frost, besides splitting rocks, does other work which the boys and the squirrels appreciate. It ripens the nuts and splits open their outer shells. You would have a sorry time getting chestnuts if you had to crack open all the burrs yourselves. And how would the poor squirrels fare, do you suppose? Now, in the same way the frost opens up the earth and loosens it.

Have you ever seen on cold mornings in the early spring long crystals of ice which extend down into the ground? You break them under your feet as you walk along. These long hard crystals are like little plows, loosening and turning over the closely packed soil at the surface of the earth. They do in the cold weather a little of the same work on the soil that the earthworms do in summer. One often sees these crystals of ice in a woodland path, where they make little caves just under the surface of the earth. They look like pillars in a fairy temple. When you see them you will step aside so as not to crush such beautiful frost-work.

On a bright summer morning you may see the grass and bushes sparkling with dew. But in the cold



weather, when the frost is at work, this sparkling dew is changed to glistening frost crystals, every blade of grass being edged with them, — crystals so delicate and so exquisite that your heart is filled with wonder at the sight of them.

When it is very cold the frost makes beautiful pictures upon the windows. It freezes the vapor that was hiding in your breath and in the air of the room wherever it touches the window-pane. You would never think, would you, that the frost had such power? Why, there is nothing more wonderful in a fairy story than this! In the make-believe story a fairy's wand turned a pumpkin into a chariot; but upon the window-pane the frost really does turn the tiny beads of moisture that are hidden in the air into the most beautiful pictures and enchanting forms.

Did you ever examine carefully the frost-work on the window-pane? Perhaps you saw there pictures of castles with trees and mountains, or pictures of open fields with fences and woods on either side, where birds seem to be flying across the open space. And did you ever notice the long plumes and the feathery ferns?

When the cold freezes the vapor which collects upon the window-pane, or the dew upon the grass, we call it frost, but when it freezes the vapor which has risen into the sky we call it snow. Hail is frozen rain-drops, but snow is frozen vapor. Those invisible drops are changed by the cold into the softest, whitest, daintiest flakes of snow.

What a delightful thing it is to watch the white, starry flakes coming softly down to cover the earth.

They make no noise, as does the rain with its pitter-patter. But sometimes, if there are leaves near by, you will hear the least, little dry rustle among the leaves when the snowflakes touch them. Then, even if it is too dark to see, your quick ears tell you that it is snowing.

The snow, instead of running off as rain does, collects where it falls until the ground is all white. It may become so deep that it is hard for us to walk. Paths and sidewalks are covered up, even the roads are hard to follow. Sometimes the snow is so deep that nothing, not even a train of cars, can make its way through it. Just think of so much snow collecting in a few hours as to be able to stop a powerful engine! The snowflakes, then, are just as strong as the many drops of water in the brook, only instead of moving stationary things away they make moving things come to a standstill. And yet one snowflake is so small and so fragile that if you breathe upon it as it rests a second on your coat sleeve, it is gone! Only the tiniest bead of moisture is left where that one snowflake was.

Did you ever catch the snowflakes on your sleeve and look carefully at them? Sometimes they are soft and thick like downy feathers. Sometimes they are clear and hard like tiny pellets of ice. Sometimes they are flat and very thin and of such wondrous shapes that they fill you with amazement. Each one is a six-sided crystal, but in what an inconceivable number of patterns! Small as they are, no two of them are alike. How can this be possible?

Do you remember the leaves you examined last



autumn to see if you could find two exactly alike? Did you find them? No, you could not. Is it, then, any more marvelous to you that the tiny snowflakes are all different from each other?

When you look at those exquisite crystals of the snow, and see the beauty and the variety of the six-sided stars, you know that no power but God's could have formed their wonderful shapes, and that no law but God's could have given those fragile stars the power that they possess when many of them work together.

When the snow lies thick and soft over the ground it is indeed like wool, for it keeps the earth sheltered and warm underneath. Where the snow has lain all winter the grass is much greener than it is where it has been exposed to the bitter winds. The new grass and the plants have a better chance to grow because the weight of the snow has crushed the dead grass and fallen leaves down into the soil about the roots. The earth is more fertile then for having been wrapped in the soft blanket of snow all winter.

Had you known before that the rain water blesses the earth in so many ways, and is so useful, and that it changes into so many different forms? There are the clouds, the rain, the brooks, the rivers, the ocean, the bubbling springs, the lakes, and then the ice, the frost, the snow and the hail. We may well find joy in all these and not discontent. When the rain or snow hinders our own plans, we should remember that it brings God's blessing to the earth, to the plants, to the animals and to the people who live upon it.

LESSON 22

MINERALS AND CRYSTALS

MEMORY VERSE

As for the earth,
The stones thereof are the place of sapphires,
And it hath dust of gold.

Job 28 : 5, 6.

God moves in a mysterious way
His wonders to perform.

Cowper.

The Purpose

This lesson upon crystals and the one following upon metals deal with subjects as wonderful as any in God's creation, if, indeed, any one phase of that creation is any more marvelous than any other. The wonder of crystallization is a lesson in itself to any one, young or old.

The special lesson which is to be drawn from it is found in the way the crystals fit together and fill the space in which they are formed. For crystals, more than anything else in the inanimate world, exhibit a truly remarkable tendency to give each other a fair share of the space they occupy.

Suggestions for the Teacher

For this lesson the teacher should have specimens of iron pyrites in slate, of granite, and of a well-shaped quartz crystal. If possible, have other crystals so the children may see the different forms. Some crystals, such as rock

candy (crystals of sugar) and alum, can be bought at the chemists, if it is not possible to procure minerals.

A striking example of crystals sharing space can be obtained by dissolving together in a glass of hot water one ounce of potassium bichlorate and one ounce of copper sulphate. If a straw or a string is put in the glass the different crystals will form upon it and show quite plainly.

As these chemicals are poisonous it is not advisable for the children to handle them, but they should see the teacher's results. They could dissolve alum in hot water and watch the crystals form as it cools about a straw or small stick resting in the glass. Always make a saturated solution, that is, make the water dissolve as much alum as it will hold, when crystals are desired.

Where possible, the children should be taken to a museum by their teacher or parents. They will never forget the surprising shapes or the superb colors of the crystals which they will see there, especially when the visit is made in connection with this lesson.

Hand Work.

A list of minerals and crystals each pupil knows is to be entered in the space left for the purpose.

Use the blank page on the leaflet for some original work. The children may, for example, draw the forms of different crystals they have seen, or insert pictures of them, or write an account of their experiment with alum.

OPENING TALK

The object lesson which the specimens of crystals will furnish is the best introduction to the story, for when they see crystals the children will be anxious to learn how they are formed.

MINERALS AND CRYSTALS

THE rain water about which we have just been speaking does its work upon the surface of the earth. Almost all of it, from time to time, is drawn up by the sun to make the clouds, and comes back once more as rain to continue in its work of carving out and smoothing over the earth's surface.

But some of the drops of rain never see the sun again. They go down so deep that they do not come back even in springs. They are not lost, though, for all their wandering about deep, deep under ground. Surely the Spirit of God is in the earth, however far down the drops may go, and He has given to these drops a work to do as well as to those which fall upon the earth and flow off into the brooks and rivers and oceans, and finally make their way back to the sky. Would you like to know what these tiny drops do which sink one by one so deep down into the earth?

The brooks, we know, need to have many, many drops to make them able to pick up and carry away pebbles and rocks, or even sand. What can these others accomplish so far underground where the rocks are almost solidly packed together? Few as they are, they carry away with them parts of the rocks they travel through, only, instead of breaking off what they carry away, these drops dissolve

part of the very rock itself, yet a part that we cannot see. Salt is a part of a loaf of bread which we cannot see or take away when once it has mixed into the bread dough. But if that loaf of bread were turned into a rock, water could go through it and take out the salt.

If you put a pebble into a glass of water it would still be a pebble. But if you should put a lump of salt into the glass of water, would it still stay there and be a lump of salt? Of course it would not. We all know that salt dissolves in water. It is there just the same, for the water tastes salt, but we cannot see it at all, or feel it. The water holds it in solution, we say, and it will hold it just as long as there is water enough to do it. When the water evaporates it leaves the salt behind and we have our lump of salt again, only changed into small grains like sand.

Now this is the difference between the work done by the water which flows off the surface of the earth and that which sinks so gradually in toward the center. The noisy, laughing little brook takes up rocks and pebbles and carries them along with it, but the quiet little underground drops, all nice and warm from their journey into the deep recesses of the earth, gently coax away the minerals which are in the very heart of the rocks. Very softly and gently they sink through the rocks, and when they get to a crack in the rock or a small hole like an empty bubble, they deposit, or drop, the atoms they have been carrying. Only, instead of dropping them anywhere and hurrying on, as does the water in the

brook, they often give up a part of themselves and are drops of water no longer. They unite with the atoms they are laying down and form some of the most beautiful and wonderful things in God's universe.

Can you guess what these wonderful things are that the underground water makes in the cracks and holes of the rocks? Yes, they are crystals. Crystals of quartz, of emerald, of amethyst, of diamonds, of garnets, of topazes, of copper and even of salt. Some are clear and transparent like the quartz and sapphires, some are red, some blue, some green and pink and yellow and purple and black. The different colors are quite as beautiful as those of flowers, and yet they are made so far below the ground that no light can reach them. You shall learn later how they came afterward to be so near the surface that we can find and see them.

It takes a long time for the drops of rain water to dissolve the atoms in the heart of the rocks as they sink deeper and deeper, but warm raindrops can seem to take almost any mineral away from those deep down rocks because they are under pressure. The brook can take a rock or boulder and quickly roll it along because it is strong from the combined force of many drops working together.

But the underground drops have to work very slowly and patiently. One sinks down and takes a few atoms, then others follow, all going the same way and all taking away with them in solution, like the salt in the glass of water, some of those tiny particles. And then instead of ever reaching the



large river and ocean, these drops come to a crack or a little empty hole, and each drop lays down not only its load of atoms but itself too, and together they grow into these beautiful crystals. The first few drops will grow into a tiny crystal hardly the size of a needle point; but as more drops come the crystals grow larger and larger, — some crystals, like beryl, becoming very large, as much as three feet in diameter. However small they are when we find them, or however large they become if they are left to grow by themselves, they always have their own shape. A crystal of quartz would never take the form of a crystal of garnet, nor would a crystal of sulphur ever become like a crystal of topaz. Isn't it wonderful that each crystal seems to know just what form to take?

Every mineral has a law which God has given to it, and when it has an opportunity to crystallize, it always forms with just as many faces (as we call its sides) as had been given to it by that law. Does it seem strange to you to think of the crystals as doing anything? Rocks have always seemed just cold, dead rocks to you, have they not? Did you think that there was any part of the rock that could change and grow?

Yet change and growth is everywhere in God's universe, and God means that the rocks shall change and grow, as trees and plants and we ourselves do, only much more slowly. Does He not change the surface of the earth that we can see? Then why not the deep places which we cannot see?

Look at the cube of iron pyrites in the slate. Who

could guess that the plain gray slate had the glittering particles in it that have been made into such pretty little golden cubes. And how could the raindrops have helped to make the iron and the sulphur, which they found in the slate and dissolved out of it, into such perfect cubes? It is very wonderful, is it not?

Or take a piece of granite. In this piece you have quartz, the transparent particles; feldspar, the white, pink or red; and mica, the flat scales; or hornblende, the black (sometimes you find tourmaline there instead of hornblende). These are all mixed up together. Although you can see them quite readily there in the granite, they do not have here their own particular shape. They have not had room to grow into separate crystals as the single crystals of quartz did. Each one of these minerals has a shape all its own, but when they are all mixed together in a mass of molten rock and the rock cools deep underground they have no room to form into their own separate shapes. They are crowded together and must do the best they can.

So all together they make the crystalline rock of granite, just as the starry snowflakes join together to make the snowbank. The minerals as we see them in the granite are not so beautiful as the separate crystals of quartz, feldspar, hornblende, mica or tourmaline would be; but granite is a very useful rock. It is as useful as crystals are beautiful. If every time these minerals came together they had all gone about making crystals of themselves without regard to each other, we could have had

no granite, and granite is very precious to man as a building stone. Of it we build walls, bridges, churches and great public buildings.

It is not only when they cool in a massive rock like granite that the different minerals give place to each other: When the rain-drops force their way through the rocks, they take up more than one kind of mineral atoms. Now when they come to the open space, it often happens that each kind of mineral wants to crystallize and each must grow into a crystal of its own shape. So they have to divide up the room. It seems strange, does it not, to think of crystals dividing fairly the space they are to live and grow in, just as children divide up their play room among themselves so each may have a corner to himself.

How do the crystals know about the room each shall need, and how they will best fit in together? Ah, that is one of God's beautiful and wonderful mysteries. He has given to the rocks and the different minerals in the rocks certain laws. These laws the rock which you look upon as dead, obeys. Whenever there is a chance to crystallize, the minerals will do so, and under whatever conditions they find themselves they do the best they can. When there is room for each to grow by itself, these minerals make of themselves such beautiful crystals of such wonderful shapes that when they are found they are treasured as gems, and people go a great distance to visit the museums where they are kept. But when they are crowded God's laws are still obeyed, whether different crystals form to-

190 THE EARTH MADE READY FOR MAN

gether, or whether there is only room for them to form into a mass of crystalline rock like granite.

Crystals are not the only things in God's world that are obliged to give place to each other. Nothing can always live just for itself. But how many of these things give place to each other as beautifully as do the crystals? Do we who are taught God's law and have the will to do it, perform it as well as these minerals do?

This giving place to each other is a beautiful thing. Every unselfish act is beautiful, whether it is in a group of crystals that can delight the eye or among a group of children whose generosity and kindness to each other delight the soul.

LESSON 23

EARTH'S UNDERGROUND STOREHOUSE

MEMORY VERSE

Surely there is a mine for silver,
And a place for gold which they refine.
Iron is taken out of the earth,
And copper is molten out of the stone.

Job 28 : 1, 2

The Purpose

The intention of this lesson is to show not only the beneficence of God in storing the underground world with treasures as beautiful as they are useful, but also the marvelous working of that law by which the world is ever changing and always for the better.

This idea will be repeated in many of the succeeding lessons.

Suggestions for the Teacher

If a visit to the museum could be made between the lesson on crystals and this one on metals, the children would have a much clearer idea of the way the metals are deposited in the veins of the rocks.

Use familiar objects to make the point of contact for the pupils. What metals do they see about them, in their homes, in the town? Which is most useful? which most beautiful? The course by this time should have helped the pupils to want to know where these common objects were formed "in the beginning."

192 THE EARTH MADE READY FOR MAN

Hand Work

The directions on the leaflet call for a list of metals, answers to questions, and memorizing of the Bible verse.

OPENING TALK

Where is the great storehouse for our food? Besides this, there are all the other substances we use from the earth. Can you tell me what some of them are? (Be sure that granite, from the last lesson, is mentioned.) All these we have named came from storehouses underground. How those storehouses are filled is what we are to hear to-day.

EARTH'S UNDERGROUND STOREHOUSE

THOSE little yellow cubes of iron and sulphur that you saw in the specimen of slate look so much like gold that they have deceived many people. The Spaniards who came to America with Columbus, seeking for gold, took shiploads of this yellow substance back to Spain, only to find that it was not gold at all. Ever since that time people have called it "Fool's Gold."

There are large deposits of genuine gold hidden away in the rocks of North and South America, but it does not look like these crystals of iron pyrites (py-ri'-tes). When gold crystallizes it has its own law to follow, and that law does not give to it the shape of a cube. But the Spaniards did not know this. They thought the little crystals were gold because they were yellow and looked like gold, and they never guessed that it was iron and sulphur that they were taking back to Spain, instead of the gold they desired.

Men know better than that in these days. They know that the color alone does not identify a mineral; they know that the shape and hardness of its crystal tell even more about it than does its color. These laws for the forms of mineral crystals have always been the same, but men have not always known about them. Little by little we are learning God's laws.


194 THE EARTH MADE READY FOR MAN

We are learning also how to find and how to use the gifts which God has stored on the earth, under the earth and in the air.

You have learned what a great storehouse there is upon the earth, in the growing things that supply us with food and clothing. The underground world is just as truly a storehouse, with everything in it packed away so methodically that it makes you think of a real storeroom. It is almost as if that rain water had fingers, and went under the earth's surface like a "good and faithful servant," picking up and sorting out the different minerals and putting them, all labeled nicely, in their proper place upon the shelves. For the minerals do have their proper places in the storehouse within the earth, and it is the percolating rain water that has carefully put them there. The rain water follows God's law, and it does not make a mistake.

There are certain minerals that are usually found together. It is as if some minerals make friends with others and like to go where they go. Children and grown people have special friends and live in groups and families. Dogs and birds are friendly with certain others of their kind, and especially so with human beings. And do you remember about the plant societies, how certain plants seem to be happier growing together, and how some cannot seem to grow comfortably with certain others? So even the rocks and minerals are grouped in societies.

Iron and sulphur are two of the minerals which often get together. When the underground rain water goes through the slate, it picks out the invisible



atoms, and they associate together to make those pretty little yellow cubes of "Fool's Gold." Iron is not found with sulphur only. It makes friends also with other minerals, and then it takes a different shape and color. When it combines with oxygen it is black, as one would expect iron to be, and often rainbow colors glow upon the shining surface of the black crystals.

No one has ever yet found iron all alone. We know that it is in the rocks, but it is so mixed with their substance that we can never find it. But the rain water can and does find it. The water coaxes the iron out and carries it away, leaving it in some convenient place. Now as iron does not like to be alone, it makes friends with other minerals before it will stay comfortably and accumulate in the cracks and openings that are like little shelves in a store-room.

Gold is stored away in many a crack and crevice. It seems to take quartz as one of its friends, for these two minerals are often found together. Only, instead of combining with the quartz as iron does with sulphur or with oxygen, the gold nestles down quite comfortably beside the quartz when the underground water leaves them both in a crevice.

Often those cracks are large, but the underground water works away until in time the fissure is all filled with quartz in which tiny flecks or small lumps of gold are nestling quite cosily.

Perhaps this gold remains hidden in the ground for a long, long time. But nothing in this world remains always the same. God's law is the law of change

and growth. Even while the vein of quartz was gradually filling up the fissure, the fissure itself was changing. It was probably becoming wider and deeper, by the action of great forces underground. For there is a great force at work in those underground rocks which cracks and crumples them. It pushes upon them so they are forced up in many places, and the rocks that were hidden deep underground are brought to light.

Just as the seed that, hidden in the ground away from the light and air, comes up when the sun calls it, so the gold, the bright, yellow gold that looks so like the sun's rays, at last comes to the surface. But it was not the sunbeam that called the gold. It was pushed up by a force that comes from God, a strange force, — lifted from its dark underground home where no sunbeam could ever have found it, or seen its golden glow.

Then what do you suppose happened to those flecks of gold? Why, the rain water went to work again upon that vein of quartz and gold! Only this time it was the rain water that fell upon the earth and flowed away in brooks and rivers, and not the underground water, that collected the gold and the quartz so long ago and deposited them in the fissures.

Would the rain water, then, flowing in brooks and streams, spoil what the underground water had done? Oh, no! not spoil it, only make it better!

This time the rain water goes to work to wear away the quartz, setting free the gold, so that now bits of gold, from tiny flecks to large grains and nuggets, are lying loose in the midst of quartz sand.



Then the waters of the brooks carry the gold and the bits of quartz sand as far as they can, and drop them, nicely sorted in layers according to their weight.

Do you remember that the brooks dropped their heaviest burdens in their own channels, and carried the lighter particles along, spreading some of them out in the low place, taking others on to the ocean? Where, then, should you think that the brooks would drop the gold? The pieces of gold were smaller than much of the sand and gravel, but were they heavier or lighter?

Gold is heavy. It is one of the heaviest of metals — even heavier than lead or iron — heavier, too, than the grains of quartz sand or the pebbles in the gravel. So it would be dropped in the bed of the stream with the heavier pieces of quartz and rock, while the sand was carried along toward the sea. There the gold would lie, not packed close and snug in a solid mass as it was for so long in the fissure of the rock, but lying loose in tiny flakes or larger grains and nuggets. It had become a free thing. Each particle, large or small, was an individual, and could move when the water rolled it along or when the pebbles and sand pushed against it.

The gold was ready now for men to use, but for a long, long time they did not find it. Finally some one who had sharper eyes than the rest noticed the pretty golden specks in the bed of a stream, just as some one saw the blackberry bush, and knew that the berries were better because the bush grew in better soil. When the gold had been discovered, men learned

how to get it out of the bed of the stream, how to use it and how to get more of it. But it was the rain water that found it first, and that brought it to light. After that, when men came to value gold so much, they learned to dig deep down into the ground, among the mountains where it was stored, and get it out for themselves.

So rain water is not only helping to make the surface of the earth more and more as God wills it to be, but it is filling the storehouses of the earth and then opening them up, showing us the bounties that God has provided.

"No thing shall ye lack," said one who trusted in God.

"No thing shall ye lack," says nature to us. "Only learn to use aright the bounties that God has stored away for you."

LESSON 24

GOD'S WONDERFUL MOUNTAINS

MEMORY VERSE

In his hand are the deep places of the earth;
The heights of the mountains are his also.

Ps. 95:4

The Purpose

The purpose of this lesson is to explain how the metals were carried first into the deep places of the earth and then brought to the surface when they are ready for man's use; and to impress the pupils' minds with the mystery and majesty of these cosmic processes, thus preparing them to reverence the power and wisdom of the Creator.

Suggestions for the Teacher

With a lateral pressure of the hands force sheets of paper which are lying upon a flat surface into folds to show the lateral pressure or the "mysterious force" which gave birth to the mountains. Compare the leaves with the picture of the folded rocks on the leaflet. After the story is read review the main facts about the mountains, which are brought out in the lesson: their beauty and grandeur; their usefulness in bringing up to us treasures that had been stored below; their usefulness in preserving what grows above the ground by bringing rain and storing it up, and the importance of the forests that grow on their sides. Try to impress the children

200 THE EARTH MADE READY FOR MAN

with the mystery and majesty of the mountains themselves, and of the forces that brought them into being.

The hymn by Isaac Watts, which is suggested as part of the memory work for the year, may well be introduced with this lesson and reviewed at intervals during the rest of the year. Have the pupils read it from the hymn book used in church.

They should also memorize the Bible verse and prayer poem found on the leaflet.

OPENING TALK

The beginning of the story makes a suitable review and introduction to the account of the formation of mountains.

GOD'S WONDERFUL MOUNTAINS

Do you remember about that mysterious force which we called the force of God, and what it did to the veins of quartz and gold that had been packed away so carefully in God's underground storehouse? Would you like to hear more about that mighty force?

Of course not all the cracks and crevices in the rocks are filled with quartz, and not all the veins of quartz have little flakes of gold lying enclosed within the crystalline mass. Neither does all the slate rock have those pretty crystals of iron pyrites. Different minerals are distributed in different places. But in whatever rocks the minerals are, the underground water finds them and carries them away to be put in their proper places.

There are many, many fissures throughout the rocks which make up the world. Indeed, rocks everywhere are full of them. Look and see for yourselves how those that show above the surface of the ground are crossed by cracks, small and large. Those fissures that you see are empty except where they are filled up by small pieces of rock, and by earth and growing things. The surface water enters the surface cracks and tends to make them wider and deeper; but the underground water fills up the deep-down fissures.

202 THE EARTH MADE READY FOR MAN

As you have already learned, the underground water is like the servant that brings treasures to the store-room and packs them away so nicely, while the surface water is like the servant that opens the storehouse and distributes the treasures for people to use.

See if you can tell what use we make of some of these minerals: gold, silver, copper, lead, iron, platinum, sulphur, salt, tin, aluminum, mercury, zinc and nickel. There are so many more that it would take a large book to tell about them. Some are individual minerals like the gold and silver, some are joined together like the iron and sulphur in the little yellow cubes, and like the sodium and chlorine which make common salt.

Some of these minerals we might do without. The metals, as we call gold, silver, lead and zinc, are not necessary for life. The first people who lived never had them. But salt and iron, in some form which can be taken up by growing things, are absolutely necessary to the life of man and animals alike, and even plants seem to need them too.

We could live, though we should still be uncivilized people, perhaps even savages, if we had not found and learned to use metals like iron, gold and silver. But we could not live at all, neither could the animals or the plants, if the rain water in sinking down did not free those invisible particles of iron and sodium and potash and the other mineral salts, as we call them, and carry them to the searching rootlets of the plants.



Would you like to know something more about the way those filled-up fissures which we call veins come to be near the surface? You will find it true, as the poet Cowper said, that

God moves in a mysterious way
His wonders to perform.

When the world was young, and when the thick, heavy fog lay so closely about it, there were no mountains, not even when the first bit of land showed above the surface of the great enveloping ocean. For the mountains are earth's wrinkles and came when it was getting old.

Does it seem strange to you to think of the world as growing old? Why, everything grows old! The sapling grows into the mighty oak, the apple-blossom into a delicious apple, the puppy into a wise and faithful watch-dog. The young mountain brooks flow into the older river which sweeps peacefully along to the sea. The sun and moon and stars grow old and change their light and heat. Then why should not the world grow old?

If our world had always remained young we could not have lived upon it. It was only after it had commenced to grow old, only after it had become wrinkled and had given up some of its secret treasures, that it was fitted to become the abode of man.

Did you ever notice the wrinkles upon a cold baked apple? When it is just taken from the oven it is round and smooth, but when it has grown cold its surface settles into wrinkles. So it is with our earth.

The crust that was so hot those long, long ages

ago, so hot that the rain hissed off in steam the moment it touched its surface, had no great ridges upon it. But when it became colder and a crust of solid rock had formed, the surface began to crack and wrinkle, that is, the mountains appeared. The mysterious force within our earth which God used pushed and crumpled the crust of the earth as it grew cold, making cracks and fissures all through the rocks, and finally raising them up in long ridges.

If you should take the leaves of your book, or some sheets of paper which are lying flat, and push them from each side they would rise up in a ridge. Try it and see if they do not. If it had been the book cover that you had pushed, it would have cracked and broken where you bent it.

In the same way the rocks of the earth's crust cracked and broke when they were bent upwards, and the chains of jagged mountains were formed. This opened up to the action of rain water the hidden rocks, bringing them nearer to the surface where man can find their treasures. The mountains, you see, are the doors through which God opens the storehouses of His underworld.

Those long chains of mountains which have been folded up on the earth do even more for us than to bring the storehouses of the underground rocks within our reach. They help to fill the storehouses which we have learned are upon the surface of the earth. For they cover their own slopes and the valleys below with growing things. They catch the clouds that come floating in from the ocean and cause them to give up the rain which they hold. They store up

the snow and give it slowly back, as water, to the brooks. The deep moss that carpets the floors of those great forests upon the mountain sides holds back the rain water like a sponge, slowly letting it go.

If it were not for the mountains with their slowly melting snow and with the thick moss holding back the snow and the rain, the water would rush down the mountain sides into the brooks and into the rivers and into the sea in roaring torrents. It would carry away everything in its path, and then leave a dry river bed and a dry world behind it. In some countries where they have cut off all the forests from the mountain sides the streams are like that,—raging torrents when it rains, dry gorges soon after. But where the forests clothe the mountains the brooks flow constantly and not too swiftly, as do also the broad, peaceful rivers.

The mountains serve us in other ways. They unlock to us the secret treasures stored up for our need. They tell us, too, in the rocks they bring up from the deep places of the earth, such wonderful stories of the way they were made and of the strange plants and animals that lived on the earth before we came. For all the rocks tell a story about our world and how it has grown to be what it is now. Men have been learning to read the stories the rocks have to tell, as well as to dig mines to secure the precious metals and the minerals that came up with them, so carefully stored away in their ancient fissures. Are not the stories precious too? For they are part of that wisdom and knowledge which is worth more than gold.

But they tell us the greatest message of all when they speak to our hearts of the power and majesty of God. He has made them very beautiful with their great, rocky cliffs, with the delicate fronds of ferns growing in their crevices and carpeting the floor of the mighty forests on their sides. The marvel of these great mountains is part of the wonder of God; and, as our Bible verse tells us, the heights of the mountains are His. Is it not true that "the strength of the hills is His"? And is it to be wondered at that people have called them "the hills of God," or that men feel very near to God when they see those massive mountains lifting their peaks above the clouds and hiding their feet deep down in the recesses of the mysterious underground world? When we see these hills of God or think about them, I believe we will understand what the writer of the hymn meant when he said,

I sing the mighty power of God
That made the mountains rise.

LESSON 25

LIFE COMES UPON THE WORLD: ROCK MAKING

MEMORY VERSE

O Lord, how manifold are thy works!
In wisdom thou hast made them all:
The earth is full of thy riches.

Ps. 104:24

The Purpose

That every particle of the whole world, even the unseen and minute, is used in God's plans for its development is the lesson to be brought out in this story. Also the important fact that nothing is lost or put aside, but it is used over and over again for better and better ends.

Suggestions for the Teacher

The lessons so far studied in this section will have given the children some idea of the vast changes that have come to our world as well as of the agencies which have been at work to make them. Subsequent lessons will deal with the strange and interesting forms of life which occupied the world before man came upon it. This lesson does not follow in chronological order, but goes back to an indeterminate past while all the agencies were still at work making the world ready for its inhabitants.

The teacher needs to note that two separate things are here to be taught: the appearance of primitive forms of life in the water, and the formation of rock from sand

208 THE EARTH MADE READY FOR MAN

and clay and stones, and from tiny shells in the depth of the sea.

If it should be possible for the teacher to see specimens of foraminifera or rhizopods through a microscope she could impress upon the children in a very vivid way the minuteness and beauty of those (probably) first forms of animal life with which our world was peopled.

The children should be encouraged to look for the different kinds of rock mentioned in this lesson. If they have no chance to visit the open country, let them see the rock of which different buildings are made. They should be told what kind or kinds of rock are the common or "country" rock of the vicinity.

Hand Work

The answers to questions on the leaflet may be made at home, or time may be given for that work at the next lesson period.

OPENING TALK

Did you know that there are different sorts of rock in the world? We have talked of one kind that is much used in building. What is its name? Yes, granite. You can tell me, too, what it is made of — that is right, crystals that did not have room to take their usual forms.

Now not all of the rocks are granite. Wouldn't you like to know the other kinds, so that when you see rocks you could tell one from another as you can plants or animals? You would like to know, too, how they are made; and you will find that the busy worker you have heard so much about is the one who had much to do in making the rocks, — water. This time it is not alone the falling raindrops, or the snow and ice, or the brooks and rivers; it is the great ocean itself and the forms of life in it that does part of the work, as you shall hear.



LIFE COMES UPON THE WORLD: ROCK MAKING

WHILE the earth was gradually cooling, long before it had become cold enough for its surface to be folded into mountains and valleys; while the rain water was busy wearing away the rocks, and while the underground water was storing up the many minerals hidden there, living things began to grow.

It was not upon the land that these living things commenced to grow, but in the water of the vast ocean. They were such tiny particles of life, those first plants, that no eyes like ours could ever have seen them. But God was working in and through them. It was because of His thought and His love that they had appeared upon the world. Those invisible plants were cared for, even though they were seemingly lost in the vast, surging sea. For God is everywhere, in the tiny ocean plant as well as the massive mountain. His care is for each and every thing upon the earth, under the earth, in the water and in the air which is about the earth.

Then other forms of life appeared. These were the tiniest of tiny shell-forming animals. Both those very, very small plants and shells increased in such countless numbers that they filled the vast ocean with their minute forms.

Ages and ages rolled by, and during all that time

empty shells were dropping slowly to the bottom of the sea and accumulating there in thick masses.

During this time, too, the land was gradually rising out of the ocean, and the ocean was becoming less vast. You will remember that not all of the rain-drops that rose to the clouds in the form of vapor got back to the sea again. They gave themselves up to becoming the beautiful minerals. There were still other drops that never even started up into the clouds to begin that long journey, but sank into the gravel and the sand and the clay which the rivers had brought with them to the ocean and, combining with these, helped to make new rocks.

That sounds odd, does it not? Who would think that the pieces of rock, the pebbles, the sand and the clay that the rain water in the brooks and rivers had been so patiently wearing away from the earth's crust would ever be used for making new rock? Yet you know that the leaves that drop off the trees are turned into soil to make other trees grow. Does it seem very much stranger that the worn pieces of rock should be used to make new ones?

Those pebbles which the rivers had been bringing down to the ocean had been accumulating upon the ancient sea beach for countless years. The sand and the clay, also, had been accumulating there in such thick masses that the layers upon the top pressed very heavily upon those below. The pressure was so great that the pebbles and the sand and the clay, saturated as they were with the water of the ocean, became gradually compressed into masses of solid rock.

Did you ever see any rock called pudding-stone? That is what the pebbles made when the thick mass of them, lying by the ocean's edge, was pressed with such force that it was cemented into a solid rock. The sand was pressed into sandstone and the clay into slate.

All through the world immense deposits of sandstone and slate are found, but the conglomerate rock is not very common. It is often called Roxbury pudding-stone, and it is used for buildings. Sandstone is used for trimming buildings, and often for the buildings themselves; also for paving sidewalks and street crossings. Slate is most useful for covering roofs, although it is used in many other ways.

You would not have thought when you saw that piece of slate that it was made under the bottom of the sea, out of particles of older rocks that the rain water had washed off, and the brooks and rivers had carried into the ocean.

You would not know, until you were told, that the sandstone was made in the same way. Yet if you look very closely at a piece of sandstone you will see the grains of sand plainly enough, and it is quite easy to see the rounded water-worn pebbles in the pudding-stone.

So all the material that the rain water had been wearing from the earth and carrying to the sea was changed back into rock, and in time raised to the surface of the earth, there to be worn off again.

Other rocks besides these were being made with the help of the percolating drops of sea water, but the particles that went to make them had never been


upon the land. These particles had accumulated far out upon the ocean floor beyond the thick beds of sand and clay. Can you guess what they could have been?

You remember we spoke of those countless, imperceptible creatures that lived in tiny shells in the ocean. These slowly sifted down throughout those long, long ages, and settled upon the ocean floor. One would hardly think there would be enough of them to make a thick mass of rock. But so it was,—age after age they collected in great quantities upon the ocean floor, and in the course of time they were pressed into solid rock called limestone and marble.

You have seen many things made of marble,—statues, table tops, mantel-shelves, and the stairs and floors of large buildings. The glistening white marble of which statues and table tops are made is a crystalline form, made by the underground water carrying a mineral in solution.

Other kinds of marble are made under the floor of the ocean by the help of those drops which soak through into the mass of accumulated shells. The pressure and the water and the heat make marble of the mass of shells, because in them are found the same mineral that the underground water carried in solution to make the glistening white marble. In some kinds of limestone we can see many of the little shells quite plainly. There they lie embedded in the stone, perfectly preserved.

How marvelous it is that those pretty little shells should be preserved through all these ages. They



were part of a living creature when no eye could see them to enjoy their delicate beauty. There were no children then to run and pick up those shells which had been cast up on the beach. But after millions and millions of years they are seen preserved in their marble bed.

It seems very strange that drops of water, working together, could have the strength to do such wonderful things. It seems quite as strange as that those dainty, starry snowflakes we were talking about could accumulate into such a powerful mass as to stop steam engines. Who could believe that the fragile shells made by those little marine animals, some of them quite invisible, could accumulate in such quantities as to be pressed into rocks massive enough to make towering mountains!

Yet in such marvelous ways does God work. To those small and often unobserved creations He gives the chance to do something great when they act together. They not only accomplish what might seem an impossible thing, but they are so under the direction of His laws that they do their work at all times, wherever they are. The raindrops are still wearing away the rocks; the loosened fragments and particles are still being deposited in the sea, where they all even now are being made into rock. In the depths of the ocean the shells are still accumulating, where they rest upon those underneath with a pressure that will make of them chalk or limestone or marble.

LESSON 26

FOSSILS

MEMORY VERSE

The earth shall be full of the knowledge of the Lord, as the waters cover the sea.

Is. 11: 9

The Purpose

This lesson about the fossils is intended to increase and deepen the child's wonder at the marvelous processes going on in the world beneath his feet and under the sea.

His love for God should be deeper and his trust stronger after he has learned about the way the delicate forms of life have been cared for, and then wonderfully preserved, so that the earth may indeed be filled with the knowledge of the Lord and of the processes through which the divine forces work.

Suggestions for the Teacher

If any of the children are fortunate enough to live in the vicinity of fossiliferous rocks the teacher can apply this lesson with peculiar force. Specimens in a museum or from some one's collection will help in teaching. In all these lessons the children should be encouraged to hunt for rocks, collect them and learn their names. Show the picture on the leaflet after the story has been read to the class.

The teacher should make very impressive the length of time that must have elapsed while these different forms of life were growing and changing and while the rocks that preserved their shape were being made. Show how the prophecy given in the memory verse is fulfilled through the records of nature's book.

OPENING TALK

Have you seen any of the rocks that we talked about last Sunday? Can you tell what is the common rock about your home? What can you tell about the way it was made?

Think of some of the ways you find out what you want to know. You ask questions, or you read books which can tell you. When people wanted to find out what happened before any one lived on the earth they found a record which could tell them. We call it nature's book, and that means God's book, too. It is not printed or written on paper; it has lasted many centuries and will last ages more. What that book is, how it was made, and some things it tells, you shall hear from our story about fossils.

FOSSILS

HAVE you ever been to the seashore and watched the waves come rolling up over the beach? Have you ever noticed how one wave will roll up and leave its burden of shells or seaweed, and then hurry back to give the next wave its turn?

Sometimes the next wave will be higher and will push the seaweed farther up on the beach; but if the tide is going out the wave will not reach so far, and the seaweed and the shells will be left upon the sand until the next tide comes in. It may be that the waves of the next tide will bring in quantities of sand which will cover all the shells and seaweed, and leave the beach as clean as if there had never been anything there excepting the smooth, white sand. But underneath, the shells and seaweed lie flat and close, while the wet sand is piled higher and higher over them.

Now in that long ago time that we have been telling about, the waves did just the same as they do now. They would roll up on the sandy beaches and leave shells scattered here and there on the wet sand. Then after the tide had gone out the new tide, coming in, would bring sand, and they would be all nicely covered up, where they would lie undisturbed.

Sometimes there would be a sudden shower, a shower where the raindrops were very large and beat upon the sand, leaving little dents wherever they

fell, just as we have showers now when the raindrops are so large that we say they make "cups and saucers."

Sometimes the wind ruffled the water in the shallow pools left upon the beach by the receding tide. The ruffled water sometimes rippled the sand underneath, leaving it in ridges which we call ripple marks. You must have noticed these when you were playing on the seashore.

Those ripple marks and those indentations made by the raindrops so long ago would be covered over by the sand which the next tide would bring in, just as the shells and the seaweed were, and there they, too, would rest undisturbed by any footfall or any little spade or shovel.

So the years went by. Slowly, oh, *so* slowly, the sand deep down underneath was turned to rock, and in that rock, all nicely preserved, were the shapes of those sea shells, the shapes of the seaweed, the marks made by the rippled sand and by the raindrops.

Those shapes were locked in the deep rocks and hidden away from sight, just as the minerals and metals were. They, too, were treasures in God's underground storehouse, and, like the rocks holding the minerals and metals, they have been brought up to the surface where we can now see them.

But the shapes of the little shells and of the seaweed, and the marks of the raindrops and of the rippled sand are treasures of a different kind from the useful metals and the beautiful minerals. They are treasures because they give us knowledge. They form a part of the book of nature, and they tell us

what lived on the earth so very, very long ago. Did you ever know before that rocks, just the common rocks that you see all about, were part of a great book?

The pebbles lying by the side of the road or on the sea beach have a history, and they tell to all those who can read from them where and of what they were made. They do not tell us exactly *how* they were made, for that is one of God's secrets. The great cliffs, and the boulders and the blocks from which our walls and buildings are made, all tell us stories, such wonderful stories!

The great cliff of pudding-stone will tell you, if you can read, "I was made out of the pebbles that the rivers brought down to the margin of the ocean."

The large squares of sandstone which make your sidewalk will say, "I was a part of a sea beach long, long ago."

The slate upon your roof will say, "I was the clay that made the floor of the ocean ages and ages ago."

The granite blocks built into a church will say, "I was made deep under ground where there was no room for all the minerals of which I am made to form in their own pretty shapes."

The marble that makes such bright patterns on the floor of a bank building will say, "I was made deep under the sea from thousands and thousands of tiny shells, the first there ever were."

Then what shall we read when we see a piece of sandstone with the surface all curved into little ripples like those upon the beach? "Oh," we shall



cry, "the wind blew and rippled the water in the little pool on the beach long, long ago." Or if we see the pitted marks upon the sandstone, we think, "The falling drops made these in the days when there were no little children to run under cover to get away from those heavy raindrops."

Do you understand, then, why the rocks form a wonderful book of knowledge? They write for us the history of the world itself. Men write for us the history of what people have done upon the earth; but the rocks tell us more than about themselves, they tell us what plants and creatures lived upon the world before we came here, and before the animals came that live here with us now.

Would you like to know how the rocks tell these things? Then think of the sea beach with all the shells buried under the sand. Think of the sand being pressed into sandstone, and then being forced up to the surface of the earth!

Then when men cut into the sandstone, and take out the blocks, what do they find there? The shapes of the perfect shells! The shapes of things that really lived on this world in those long ago days when the world looked so different from what it does now. Is not that like reading a book, — a book, moreover, that is all filled with pictures?

Many different kinds of shells are found pictured in these rocks, and not one of them is shaped just like any that we have now. There were coral insects in those early seas building their branching reefs. Later there were starfishes and sea urchins, but all were different from those that are now in existence.

While these thousands and thousands of different shells were dropping one by one onto the floor of the ocean and being cast up on the sea beach, there was another form of life growing in the vast ocean, a higher form. These creatures were not covered with shells as were all those which had lived before. They could move freely, they could swim. Can you think what they were?

Fishes; yes, but strange-looking fishes, not at all like those found now in our seas. Most of them had armor, a hard, bony armor arranged in scales like coat-of-mail, and having these for protection they grew to be of enormous size. The whole ocean seemed to be full of them, as it had been before so full of the shell-covered animals.

Do you ask, "How do we know?" Can you not guess that the rocks tell us?

There the fishes are, in the rocks; caught in the soft clay and mud of the ocean floor when they died, or cast up on the sea beach and covered by the sand. Such extraordinary looking fishes as the rocks picture to us. With their strong armor, something like a turtle's shell, and their huge size, we wonder how they ever moved about in the sea.

Gradually, however, there was a change. As the ages rolled by the forms of the fishes became more and more like those we see. For the world changed, and the forms of the animals and plants changed also to accommodate themselves to the changing world. The rocks that were formed under the sea in that later period show us the fishes and the shells as they changed and grew to look like those we now see.

Such a wonderful book is this book of nature. In it we may read the record of the past. The stones which make for us this picture-book bear God's record of creation, and tell the wise men who learn to read that record how God works in our world. Shall we listen to what has thus far been read from their stone pages printed over with ripples and holes, with shells and queer fishes, that we may know more about God? For all that we learn of God's way in nature teaches us to love and trust Him more.

LESSON 27

HOW OUR COAL WAS MADE

MEMORY VERSE

Be not therefore anxious, saying, What shall we eat? or, What shall we drink? or, Wherewithal shall we be clothed? for your heavenly Father knoweth that ye have need of all these things.

Matt. 6 : 31, 32

The Purpose

A lump of coal, black and serviceable, tells us a remarkable story of how the poisonous gases that covered the earth at first and would have made life impossible were absorbed into strange forms of vegetation; how these were buried in a mass under rocks for ages; and how men now dig the mass up as coal, thus using what once would have brought death, for the promotion of the fullest life. The children are to learn this, one of the strangest stories in the book of nature, and see how it bespeaks a Providence that works on long lines for the welfare of all the children of earth, and turns everything into good. It is this age-long preparation of earth by God who knows all our need which warrants the trust of which Jesus spoke when he said to his followers, "Be not anxious."

Suggestions for the Teacher

If there is a peat bog in the vicinity or a deeply wooded marsh arrange for the children to visit it and show them the black leaf mould that has been accumulating there.

Tell them that under the right conditions that would also make coal. They may like to learn the differences between peat, and soft and hard coal.

The teacher should try to get as vivid a mental picture as possible of the coal-making process before attempting to tell of this interesting phase in the development of the world.

The lesson of trust taught by this story and the words of Jesus in the memory verse will have value only as the child who says "God did all this for me" learns that every child of earth has the right to say the same thing. It is another emphasis on the thought of living together and serving one another, which the Beacon Course enforces as a fundamental principle of religion.

Hand Work

Try to secure thoughtful answers to the questions about the sort of thanks we may give for earth's bounty and our responsibility in sharing it. The other three make a test of the pupil's attention to the lesson story.

OPENING TALK

Have you ever seen a fossil fern-leaf on a stone? (If possible, secure one to show to the class.) Can you tell how it came there? Would you like to hear how not only leaves, but great tree trunks, whole forests, were buried in the earth, and what use we now make of them?

HOW OUR COAL WAS MADE

WHAT was happening on the surface of the earth during all that time when the life in the sea was spreading and growing and being pressed between the leaves of nature's book? Did the dry land remain bare and lifeless?

Oh, no. The dawn of life had come there too, at last. Earth's garment was beginning to creep over the rocks and to cover the marshy places with green. The same lowly plants that start to clothe the bare rocks now, the lichens and the mosses, long ages ago commenced to creep over those water-worn rocks. Tiny ferns began to tuck their little feet into the cracks and crannies of the cliffs. And in the hollows, where the waters of the streams had spread out with their load of pebbles and sand, rushes sprang up and made a mass of green.

The earth and the air were warm and moist, so that these new forms of life grew and increased in number and in size, as did the shells and the fishes in the sea. The small rushes that first started to grow in the shallow pools changed as ages rolled on, so that by the time the large fishes swam ponderously about in the cooling seas these rushes had grown so large in the wet clay that they made great dark forests of tall, strange-looking trees along the margin of the seashore.

Think of our common horse rushes, slender stalks, scarcely ten inches high, growing as trees taller than your house and as large around as a tub. It is difficult to imagine how they would look, is it not?

Do you know the club moss that grows upon the mountains and the ground-pine that is twined into wreaths and festoons for Christmas decorations? Try to think of these as trees, queer, rough trees, three times as tall as your house and as large around as a cartwheel. The thick, bristling branches were covered with long scales, instead of leaves, which dropped off, giving place to new ones, as the pine needles do.

In the wet, swampy forest land ferns grew in as pretty clusters as they do in our swamps, their graceful fronds almost sweeping the surface of the shallow water. Some of the ferns were very small, with dainty little fronds that were almost lost in the immensity of the dark forest. Some grew so large that they made trees like the tree ferns that grow now in tropical forests. Like the tropical ferns they had tall, thick trunks, with a bunch of long fronds drooping from the top. So the forests stretched out, dark and somber, with pools of still, black water lying between the huge trunks of the trees, and reflecting in the dim light the groups of pretty ferns.


But there was no bright green grass filling in every nook and corner between the roots of the trees; no plants covered with brightly colored flowers, no fruits, no spreading foliage. Silent, too, was the forest, for there were no leaves to rustle,

no branches to sway, no chattering squirrels to gather the nuts that fell to the ground, no birds to sing and fill the growing world with joy. Only the hum of insects broke the absolute quiet of those long, long stretches of marshy forest land. Big dragon flies skimmed over the water of the black pools, and locusts flew up from the ground with their peculiar buzzing sound.

The rain still fell almost continuously and the clouds hung low over the young world. The air, too, was heavy over the thick, dark forests. It was not like the clear, fresh air that we breathe with its life-giving oxygen. Instead it was full of carbonic acid gas, a gas which plants need for their growth but which we cannot breathe and live. The long scales of those early trees drank from the air that gas which would have been a poison to the lungs of animals or men. But to the trees it was life and strength, and they grew so luxuriantly that no others in all the world have been like them.

With their roots in the wet earth drinking in the water, and their scales breathing in the heavy gas-laden atmosphere, the trees of the mighty forests grew and flourished. They flourished for so long a time that you could not even measure it in your thoughts.

The long, slender scales dropped off from time to time, and lay decaying in the water of the swamp. The great, bristling branches dropped away as the immense trees lifted their heads higher and higher into the heavy atmosphere, moist with many showers. The ripened spore cases scattered about their thick,



brown, powder-like spores, and the fronds of the ferns, large and small, dropped down, too, into the water. The trees grew old and died, and, falling, filled the swamp with their great decaying trunks and branches, until what had once been long sheets of water became thick, oozy marshlands like a bottomless bog.

Often during those ages in which the forests were growing and filling in the pools with the thick, black mold, the sea would try to reclaim a part of the marshy land, and make it into a strip of beach once more. The waves would come rolling in, bringing clay and sand which would spread over the surface of the marsh and cover up the masses of branches and stems and fern fronds that lay there. If the sea held its sway long enough, the mighty trees would finally die and, falling, be covered by the burden of sand each rolling wave brought in, until all evidences of a forest would be gone, — buried far beneath the waves of the victorious sea.

In time, however, the sea would build a barrier even against itself, so that the waves could no longer roll in over the higher beach, and cover the swamps with sand and clay. Then the rain and river water again collected behind the high beaches, again made swamps in which trees and ferns commenced to grow. So in time there was another immense forest, growing upon the clay and sand that had covered up the older one. In some places the ocean overthrew and buried many forests, one after another, before it was finally conquered and the land along the seashore rose and became dry ground.


Do you feel sorry that those great, silent forests were caught and overwhelmed by the floods and by the ocean tides? Do you wish that there might be such wonderful forests growing now and that you might see them?

That could never be, for the trees of those immense forests could not live in the air you breathe. They grew until they had used up the carbonic acid gas that so filled the moist, heavy air in those early days. When that was used up and they could grow no longer, they gave place to new kinds of trees more suited to the different air, and more like those we know.

But the carbon was not really lost, although the great trees had taken it out of the air. None of those elements of which the world is made are ever lost. They are used over and over again, but always kept in some form. Are not the pieces of the old rocks made into new? Are not new rocks made also from the cast off and broken shells of the countless little animals of the sea? The carbon, too, that was once in the air in the form of a heavy gas has been saved from that day to this.

But how? Those mighty forests were no longer there. They had been buried so deep under sand and clay that no trace of them was left. Yet they were never lost to God's sight or to His purposes. They had only entered the wonderful underground workshop where God's forces are making over into new forms substances that have done their work in another.

Deep under the ground the same pressure was at



work upon that thick, black, oozy marsh, full of the fern fronds and the scales, the branches and the tree trunks that had fallen into it. Then the marsh was changed into a black, shiny mass of rock in which was stored the carbon that the leaves and trunks of those immense trees had breathed in from the heavy air.

Can you guess the name of this black rock? Yes, it is coal. In the underground storehouse the carbon that was not needed by the growing world was packed away and saved to be given back to the world again in a form it did need. For the carbon that would have poisoned us, had we breathed it in that heavy atmosphere, could be used for giving warmth when the world was getting cold. In such wonderful ways does God provide for all His children.

When the pressure upon the buried marsh turned the black soil into rock, the clay and sand below the swamp, and that with which the waves had covered it, were changed into rock also. These rocks, too, became a part of nature's book, for they were changed into slate and sandstone and they have preserved for us the record of what grew in that ancient marsh. In many a strange and beautiful way they show us what sort of plants and trees those were which made our coal.

Underneath the black coal, standing upright in the slate that had once been clay, are trunks of trees all turned to stone, with long roots stretching through the mass of rock. While above the coal, between it and the layers of the slate, are the forms of delicate little ferns, of large fronds and of the scale-covered

230 THE EARTH MADE READY FOR MAN

branches. Even the dragon flies and locusts were caught and pressed; for when anything fell from the forest upon the soft clay that the sea had brought in, it was pressed closely and preserved.

In the layers of slate or shale above the coal there have been found more kinds of ferns than we now have. The shapes of many of them are so perfect that it seems as if the most careful fingers had smoothed out the delicate fronds and pressed them between the leaves of a book.

Shall we not sing a song of praise to the Creator who has kept for our use in the beautiful marble the excess of carbon taken from the water, and in the useful coal, the carbon taken from the air? Who has also preserved the forms of the shells and plants that made the marble and the coal, so that we may now see and know in what a wonderful way they were made.



LESSON 28

MORE WONDERS FROM NATURE'S BOOK

MEMORY VERSE

A thousand ages in thy sight
Are like an evening gone,
Short as the watch that ends the night
Before the rising sun.

Isaac Watts

The Purpose

The rocks themselves tell us by what gradual and age-long steps God has been accomplishing His purpose in the world. They give a picture of change and growth, of that "increasing purpose" which runs through the ages.

With even the slightest knowledge of the growth of the world the feeling of God's constant presence should grow and deepen in the child's consciousness.

Suggestions for the Teacher

Any fossils that can be used in these lessons should be shown. Those children who live in the Connecticut valley where the red sandstone out-crops should have an opportunity to see the remarkable footprints in the rocks. Fossil remains of trilobites and other early forms are found in the rocks in northeastern Iowa. Use whatever can be found in your own locality, or any specimens or pictures you can secure for illustrations.

Adaptation to environment and the fulfilling of God's

232 THE EARTH MADE READY FOR MAN

laws is exemplified by the continuous life of the ant upon the world for long, long ages of time, while other animals have died off or changed.

The hymn on the leaflet expresses a profound religious sentiment. Have the pupils learn at least the verse from it given with this lesson, or better, the whole.

OPENING TALK

Suppose that you should be digging sand upon the seashore and that you stayed so long down by the water that rain began to fall and a high wave surprised you, how quickly you would jump up and run to a place of safety, leaving your footprints on the wet beach, and your pail and shovel just where they were. If the waves of the incoming tide should be full of sand, your aluminum pail and shovel would be hidden from sight before the tide went out, and you would never get them again.

Long, long ages afterward, some one might find your pail and shovel and your footprints in some sandstone that was being quarried for a building. Then he would know that a child had been playing ages before on the beach where the sandstone had been made.

Now you shall hear how animal footprints and other marks were left in the sand and made into stone ages ago, long before there were any people in the world.

MORE WONDERS FROM NATURE'S BOOK

AFTER those great forests had done their work by clearing the atmosphere of its burden of carbon, a great change came. The sun began to shine through the clouds; not peep through with a soft glimmering light, but shine directly through, with rays so bright that they would make a shadow.

Then all the living things upon the whole world changed. Some kinds of the giant trees died out and were seen no more. Other kinds became smaller and smaller from age to age until they dwindled down to the size of our queer little horse-tail rush and our ground-pine. New trees of a different kind commenced to grow on the higher ground, and the sun caused them to flourish and to spread. Among these were the conifers or cone-bearers, the first of the group of trees to which our pines and hemlocks belong.

The animal life, too, was changing, for the air was now fit to breathe. Out of the water came the queerest-looking creatures that you could ever imagine. They were the amphibians; that is, animals that could live either on the land or in the water. You remember how the little tadpoles, after they are hatched from the eggs, live in the water almost like fishes, and how, when their legs grow and their tails shrink away, they leave the water and hop out on the


land. Well, away back in those times when the giant trees grew, these creatures commenced to walk out of the water and onto the seashore. They were the same kind of animals as the frogs, and they could live, too, in the water or on the land, but they were as much larger than toads or frogs as you can think or imagine. Sometimes they walked on the sea beach and left their great footprints in the wet sand and mud.

And what do you suppose happened to those footprints? They were preserved for us in the sandstone, and now make some of the pictures in nature's book of the rocks.

Sometimes in among the footprints there are rain-drop marks — big ones — showing that there was a hard shower with great, heavy drops. But the queer animals did not care. They could live in the water if they chose, so they walked right along and did not try to get under cover.

Sometimes in the slate that used to be the muddy flats of those days there are marks that we call sun cracks. Have you ever noticed those queer cracks on the surface of dried mud? The same shaped cracks were made in the drying mud long ago, and when we see them in the rock we know that the sun came out bright and hot, and dried the mud quickly.

After the amphibians had had their rule in the water and on the land, reptiles came, — the strange, huge lizards that would make even the dragons of fairy tales seem quite ordinary. These reptiles lived by the side of the marshes and walked about on the exposed mud flats. They may have gone down at



low tide to get their food from among the seaweed, or to catch some of the smaller fish. Of course we do not know just why they walked about upon the shore, but we know that they did walk there, for they, too, left their footprints. They went lumbering along, some of them walking on four feet, some of them walking on two with a pair of shorter forelegs to rest on, and dragging long tails after them, much as a kangaroo does. They left their tracks upon the sand and mud they walked on, and these were preserved so that we see them many, many years afterwards.

Many of their bones have been found, too, and so we have been able to picture to ourselves how these monstrous creatures looked. It was when they ventured out too far upon the soft mud that they were caught in it, for how could they pull their huge feet out from the soft, sticky mass? Then the mud hardened into rock, and their bones were preserved. Whole skeletons have been found and set up in museums, so we have these, as well as the footprints in the rocks, to tell us what huge creatures lived upon the earth when it was still young.

Not only those great footprints but even the tiny tracks of insects are perfectly preserved in the rocks that were once mud. There were many insects then, grasshoppers, dragon flies, beetles and spiders. Some of them walked along on the fine, damp mud and left their tracks and often they, too, were caught where the mud was too soft. Their feet were small enough, but they had so many that while they were pulling out a pair of feet all the others would be hopelessly

caught. So we have their tracks and their bodies all nicely preserved for us in nature's book.

By the leaves and pictures of this marvelous book we can tell how the earth went on changing and growing; for learned men who love nature have studied the rocks, to read what is told there. They have put together the huge bones there preserved and so can tell us what those strange animals looked like and what kind of feet made those tracks.

They tell us also that strange birds came which at first looked like winged and feathered lizards, but which changed from age to age until they became the birds we know and love so well.

There were other creatures of the bird family, something like ostriches. They walked about on the land, being quite too heavy to fly. Queer foot-prints they have left. Men find also the fossil forms of great bats, six times the size of ours, and of enormous turtles and crocodiles. Even flies and ants have been preserved from that early time. Only think how much longer ants have been living on the world than human beings. When next you see an ant, stop and think how long its kind has lived upon the earth. Many of the other creatures were too large and too clumsy to adapt themselves to the changing world. So the large creatures died off and gave place to smaller ones. The amphibians, that were once as large as alligators have changed and become in time the frogs and toads that we see; while the reptiles that were so extraordinary in their size and shape have changed also, adapting themselves to the changing world until they have become the turtles,

lizards, snakes, alligators and crocodiles of our time.

The world was all this time getting ready for a new form of life. Man was coming, and his four-footed friends were coming; and many changes must still take place before the world could be a home for them.

With the sun shining brightly between the clouds, the seasons came. There could have been no summer or winter when the thick clouds hung so heavily about the world. They kept the atmosphere close and warm like that in a greenhouse; and strange as it may seem, those immense trees that made the first coal tell us that there were no seasons then. For there are no rings in their fossil trunks to show any signs of yearly growth. But the later rocks that show us sun cracks, show us tree trunks with annual rings like those our trees now have. We know that there was summer and winter then in the temperate zones, because the trees of that time grew for half of the year and rested the other half.

So, with a change of climate trees like ours commenced to grow. Besides those early conifers, the oaks, maples, elms, and willows, the walnut and the sassafras trees began to clothe the earth with their graceful, swaying branches and fluttering leaves.

Then the flowers came. They did not at first have all the lovely colors that we now see. They were green in color, like the leaves.

Do you remember what has helped so much to develop the bright colors of the wild flowers? Yes, it was the bees. It should not seem strange, then,

should it, that those same pages of nature's book that show us the flowering plants should show us bees?

With trees like our trees and flowering plants beginning to be like ours, the world commenced at last, after so many countless years, to look much like the world as we see it. There were shells like ours washed up on the beaches, fishes like ours swam in the sea and in the rivers. Smaller dragon flies skimmed over the water, butterflies fluttered over the blossoms, sipping their nectar, while bees gathered the pollen. The ants were there, and June bugs, and many more of the insects that we know. And all, the leaves of the trees, the flowering plants, the insects, as well as the shells and the fishes and the bones of animals are pictured for us in that wonderful book which has earth's rocks for its pages.

Throughout those countless ages of change and growth God watched over the world and blessed it with His love and thought. When there was no human mind to observe what was going on, everything was working together in the love and harmony of God's perfect law.

LESSON 29

THE STORY THAT A SCRATCHED ROCK TELLS

MEMORY VERSE

Speak to the earth, and it shall teach thee.

Job 12:8

The Purpose

This last great change in the world before man came is of special interest because to it is due the contour of the land in the greater part of North America and Europe. Wherever the great ice sheet ploughed its way it left a changed world.

It altered river systems, caused waterfalls, left lakes scattered here and there, spread out wide plains, lowered mountains and raised valleys. To that ice sheet mankind owes all that has made the north temperate zone the fitting home for his onward struggle in civilization.

Use the story to illustrate how the earth may indeed speak to us of the wonderful things God has done.

Suggestions for the Teacher

This lesson offers excellent opportunity for review of the last three, which deal with different sorts of rocks and call them nature's story-book. Here we have one of those stories for the lesson.

The glacial scratches, the smoothed rocks and hills and the "mantle rock" that was left every where by the

240 THE EARTH MADE READY FOR MAN

melting ice form the last page in nature's book before the advent of man.

The children should be well impressed with the idea that the world is still changing, in spite of the fact that the changes are so slow that we do not realize them.

We are still in the Glacial Age. That our climate is growing warmer is proved by the fact that the last remnants of the great ice sheet are gradually retreating, but we are insensible of any change ourselves.

Impress upon the children's minds, as always, the countless ages which have elapsed while this last change was going on, causing the earth to be plowed over and adapted for God's highest creation, man.

OPENING TALK

Can you think away the thick masses of ice and snow that cover Greenland, and picture that island as covered with a luxuriant forest?

Can you forget for a moment the stories you have read about the Eskimo hunting over frozen seas for the walrus and the polar bear, and think instead of soft, blue, tropical seas like those around Bermuda, where white coral reefs gleam beneath the surface of the water?

Try, while we have the story; for then you will know why it once deserved the name Greenland, and how it came to be the land of snow and ice that it is now.



THE STORY THAT A SCRATCHED ROCK TELLS

How many of you have read about the Eskimo children and that singular land of ice and snow in which they live? It is called Greenland, though it is far from being a green land now. Yet it is quite true that Greenland had once as warm a climate as the island of Cuba has now.

It seems very hard to believe, yet the pages of nature's book tell us that it was so. The rocks of Greenland, where the snow has left them uncovered, tell us strange stories of what once grew upon that land now buried under snow and ice.

Did you ever learn about the coral polyps and the work they do, making great coral reefs in the warm southern seas? Once they built in the warm seas that were then about Greenland. On the land great palms lifted their feathery tops high in the air. Ferns of all kinds made the ground green with their graceful fronds, while Sequoia trees, like the giant trees of California, towered above such other tropical trees as the fig, the ilex and the magnolia.

For ages and ages Greenland was like a luxuriant, tropical island. But there came a time when all that was changed. It was after the "coming of the seasons."

At first the difference between summer and winter

was not great, but the winters grew colder and colder. In time they became so severe that even the summer sun was not hot enough to melt away all the snow that had accumulated during the long, cold winters.

First the mountains became snow-capped. Then, as the cold grew more intense, the snow caps grew until great bodies of ice commenced to flow down the mountain sides and into the valleys. Rivers of ice these were, not rivers of water which had been frozen into ice, but rivers composed of ice, which flowed down the mountain sides with a great force.

There are a few such ice rivers still left upon the world. We call them glaciers. They are not at first rivers of solid ice; they start as rivers of snow, that kind of hard, icy snow that we see left on the ground in the spring. They are pushed on with such a force, however, that the icy snow is soon pressed into a compact mass of ice which really flows slowly along over the ground, scouring for itself a bed out of the solid rock.

If you take up a handful of snow and press it hard, you will soon have a ball of ice instead of a snowball. So the enormous pressure of the snow accumulating above, forces the icy snow out from beneath, and then presses that into ice as it slowly creeps down the mountain side.

You remember what a power snow has to stop a railroad train. Yet when snow moves as it does in a glacier its power is much more tremendous, for then nothing can stop it. It pushes everything out of its way, and grinds rocks to powder.

Think what a mighty force a sheet of ice half a

mile thick must exert when it moves over a whole country as it does in Greenland. So long as the snow accumulates faster than it melts, nothing, not even mountains, can stop the ice sheet thus formed as it slowly moves over the surface of the land to the sea.

Such a glacier as that once passed over the northern part of our country. In places it was a mile thick, and it covered such high mountains as Mount Washington and the Adirondacks.

If you ask how we know about such a strange thing as this, we answer as we have answered so many times before, "Because the rocks tell us;" not from their structure or from the fossils they enclose, but from the marks upon their surface. For they are smoothed over as if a mighty force had been at work upon them, and often those smooth places are scratched with straight parallel lines and grooves.

"What sort of writing has nature made upon these rocks?" men have asked. "Why should the rocks north of a certain line be so smooth, with long parallel scratches upon them, while those south of that line are just as the rain-water has left them?"

So people wondered, until a great man named Louis Agassiz, who came to America from Switzerland, showed us how to read this part of nature's writing.


He had seen glaciers at work in his native country, for there are many of these rivers of ice among the high Alps, and he had watched them carefully. He had noticed the strange appearance of the rocks

wherever the ice in melting had left them bare. They were smoothed off and almost polished, while deep scratches ran parallel to the direction in which the glaciers were moving. So when he came to this country he knew what those marks meant which had puzzled our learned men.

Glaciers had made the marks, — glaciers of such extent that they stretched in one mass of ice across the northern part of North America. As high upon the mountain sides as the rocks were ground off, so thick was the ice that had flowed over the land. It had scoured off all the rocks on its way toward the south, and carved them with straight lines and grooves.

What do you suppose were nature's carving tools? They were the pieces of rock that had been broken off the ledges as the mighty glacier pushed its way irresistibly over the land. Frozen into the mass, they were held as tight as in a vise. Thus they traveled with the moving ice, scraping the rocks smooth while the harder, sharper fragments scratched parallel lines on the surfaces that had been already bared and smoothed. Such records do the glaciers leave now upon the rocks in the Alps, in Greenland and in Alaska. Such records the glaciers have left upon the rocks in the northern part of North America and Europe.

Nature has many other ways of telling us about the "Great Ice Age" besides the telltale lines and the smooth rocks. She tells us by the changed shapes of the mountains, by the filled-up valleys, by long, even ridges and rounded hills, and by the



great stretches of land covered with gravel and sand and boulders. These the great ice sheet left scattered about over the ground when it finally melted and retreated toward the north.

Although nothing upon the earth's surface could stop a great glacier, the sun's rays could. So, when the climate became warmer, the vast ice sheet melted into rivers of water and gradually shrank away until now only a few mountain glaciers, those of the Alps and Rockies, and those in the polar regions, are left.

In Switzerland rivers of water come pouring out of the end of the melting glacier. So in our country long ago rivers must have poured out all along the southern margin of the ice-sheet as it gradually melted away. Here and there vast beds of gravel and sand were spread out by these gushing waters; here and there huge boulders that had been carried under, in, or upon the ice were dropped and left, sometimes piled up in strange confusion.

When at last our country was free from its ice chains, and the rushing waters that had carried the melting ice to the sea had finally subsided, what a changed surface was laid bare! The sharp peaks of the mountains had been rounded over, and smooth, round hills of clay were scattered about where no hills had been before. Plateaus of sand stood high above the level plains. Long even ridges of gravel stretched along like artificial embankments, while thick sheets of gravel were spread over great tracts of land, often blocking up the river channels and damming back the rushing water into beautiful lakes.

Although the ice had plowed through the forests and ground them to powder as it advanced, when it had retreated the land was not so desolate as one would think. It did not leave the rocks wholly bare, but it covered them as it melted with the gravel and sand, as with a mantle. So the little flowers that follow the melting ice and grow up to its very edge had soil to grow upon. So did the trees and the other Alpine plants, as they slowly advanced, following the retreating ice sheet.

It took very, very long for all this to happen, but by the time the warmer climate had locked the ice sheet up in the polar regions, our country was clothed again with forests and ferns, with shrubs and plants of more varieties than had ever grown before. Animals, birds and insects came again to inhabit the land, and most of these, too, were different from any that had formerly lived here. These animals are those that we know as man's four-footed friends. And with the animals came man.

To what a world the human race came at last! What a storehouse of riches, what a place of beauty, what a land of resources was this world that God had prepared to be our home. As marvelous as the riches which God has stored away for us, or as the beauty with which He has covered the earth, or as the bounties which He has scattered aboard, are the records which He has left on the rocks of the world so that we may learn in what divine, wonderful ways those gifts which we see and use were prepared for us.

PART IV

The Coming of Man

Thou hast made him but little lower than God,
And crownest him with glory and honor.

Ps. 8:5



LESSON 30

MAN COMES UPON THE EARTH

MEMORY VERSE

Who knoweth not in all these,
That the hand of the Lord hath wrought this,
In whose hand is the soul of every living thing,
And the breath of all mankind?

Job 12:9, 10

The Purpose

There has been no attempt in this lesson to make any scientific statement as to how man came upon the earth, or just when and where human beings appeared. In as simple and straightforward a way as possible with such a complex subject the children are told of man's humble origin, the slow steps of his progress, and the means by which it was achieved.

The purpose is steadily held to make clear at the same time the endowments which place man above the lower animals, and the spiritual inheritance which reveals itself in his worship and his steady advance.

Suggestions for the Teacher

The teacher should study all the lessons of Part 4 before undertaking to teach any of them. With a clear picture in mind of the growth of the human race in civilization it will be possible to make a far more vivid presentation to the children.

If the teacher can succeed in making those earliest

days when man was just beginning to grope his way into consciousness seem real to the children, the purpose of the story will not be lost.

The religious thought running through all these lessons, that God is with us continually and leads us on to all that we accomplish, should never be lost from sight. The opening talk suggests it as the atmosphere in which the story of this lesson should be given and received.

Hand Work.

To prepare the pupils to do the work asked for on the leaflet it will be well to talk a little about the two subjects in class. Encourage original expression, and ask to have the work brought next Sunday to be read in class.

OPENING TALK

Do any of you know those lines named "Baby," written by George MacDonald? (The teacher may well read the poem to the class. It will be found in many collections of verse.) Notice these two lines:

How did they all come to be just you?
God thought about me, and so I grew.

Isn't that true about all people, even those that first lived on the earth? In the story of creation as told in the first chapter of Genesis, a verse says, "And God created man in his own image, in the image of God created he him; male and female created he them." Shall we remember, as we read those words, that the thought of God created mankind to be like himself, and that through long ages people grew better in all ways because God still thought about them and led them on?

MAN COMES UPON THE EARTH

So to the world that had grown beautiful and useful under God's love and thought, human beings came.

Just how they came or just when, no one knows; but that they were living here when the thick ice sheet was melting away, we are quite sure. For, buried in the masses of sand and gravel that the rushing waters spread around, have been found some of the stone weapons that those early men had used.

The animals have left shells and footprints, and many of their forms preserved in nature's book; the plants have also left their forms and shapes; but men have left the things that they have made and the record of what they have done. Tools, weapons, pottery and sculpture, buildings, drawings and writings, these are the things that tell us about mankind, where men have lived, how they have lived, and often, too, what kind of people they were.

The very first men did not know how to make any of these things. They came upon the world like the animals, and for a while they must have lived somewhat as the animals did. But it was not for that sort of a life that God had sent them upon the world. He had given mankind gifts that the animals have never possessed: an upright figure with swinging arms; hands with five, flexible fingers; a thinking, reason-

ing brain and a throat and tongue which can be trained to communicate the thought of the mind. But even more than all these, God has given to mankind a loving spirit which is a part of Himself. Because of this precious gift men became the children of God.

How do you suppose they began to use those gifts that made them so different from the animals? What impulse first made them stoop to pick up a stone and then throw it in self-defense at some animal prowling near by? What made them notice that a sharp stone would defend them better than a round one? And what was it that prompted them to chip one stone to a point with another?

Monkeys and apes will throw stones to defend themselves, but they have never been known to sharpen them to a point. They have not the seeing eye and the thinking brain that men have. The eyes of men see not only the objects about them, but they see what can be done with the objects.

Did you ever watch a baby trying to put one block upon another, and hear its happy laughter when it succeeded? Probably those early men laughed with surprised delight when they found that they could do new things, for they were but babies, after all, in this great, new world.

There is something within us all that urges us on to try always to do things in a better way. That is our spirit, the supreme gift of God. And even in those early days, the spirit which was a part of each man and woman urged them on to better ways of life.

They first lived in caves. They ate roots and



bark, nuts and berries, while they defended themselves from the dangerous animals with stones. Soon they learned to eat the flesh and wear the fur of those they killed in self-defense, and then, after they had succeeded in making weapons for themselves, they went upon the chase to find those animals, the meat and skin of which they liked the best. With the chipped and sharpened rock fastened to a stick of wood as an arrow or a spear or a hatchet, they could be quite brave, hunting down the wild creatures they wanted; not just huddling together and protecting themselves.

So they learned to make many implements. Some were of chipped stone, with bone or wooden handles, some of sharpened bone and some of sharpened wood. They learned also, that if they were brave and watchful they could overcome even the most dreaded of the animals. It would not take them very long to see that the animals always went about their hunting in the same way, each according to his kind, and never changing it, while they could always do things in a different way. They saw, also, that the braver and more courageous among them were the more sure of outwitting the dull beasts.

In some way they learned the use of fire. How surprised they must have been when they found what a useful friend it could be to them! It would cook their food; it would keep them warm; and, best of all, it would keep away the prowling animals.

At first these cave men must have saved the fire, probably from the embers of a forest fire; for nature's book tells us that there were some forest fires long

before careless men set them. These embers that the cave men saved they tended carefully with dried leaves and twigs. Very, very careful they had to be of those fires, for if they let them go out where could they get another? But after a time they learned to start their fire. Perhaps it might have happened this way.

Suppose that two of those men were busy in their cave long, long ago, boring a hole in a piece of wood with a sharpened stick. That was the way they made the handles for their stone implements. Now it might have happened that the wood they were using was much harder and drier than usual, and the man who twirled the pointed stick was very strong. He twirled so fast that the wood became quite hot, and smoked a little. But neither of the men knew what that meant, and so they kept on with their work. Then, suddenly, a flame leaped from the hole they were making and burnt them and their sticks of wood, and even the dry straw spread over the floor of the cave for a bed.

Now it may be that the first man was angry, seeing that all their work was ruined and their beds gone. But the second man, the one who twirled the stick, waved his arms and shouted for joy, because he saw how men could make that mysterious and useful fire when they wanted it.

So the stick-twirler ran for more wood, and, squatting down at the entrance of the cave before all the other inhabitants, showed them how to get a spark that they could coax into a fire. That was a joyful discovery, for it meant that they would not have to



stay always where the fire was, but that they could move about and make a fire wherever they happened to be.

Later these cave men learned to make fire in another way, by striking very hard pieces of stone together and getting a spark. Even so recently as our great grandfathers' time a piece of flint and a rod of steel had to be used to start a fire, when the old one went out.

These ancient men looked upon fire as a friend, a mysterious friend, that they could not understand. The animals were all afraid of it and so it kept them away. Then, too, it kept the people warm through those long, cold nights. The climate was still much colder over all of Europe and North America than it is now, for the great ice sheet had not entirely melted away. And these men, even after they had learned to chip stone weapons and make a fire, yet did not know how to clothe themselves comfortably.

Finally, those early cave men learned to use the fire to cook the meat and nuts that they had been eating raw. Then they soon learned to grind the seeds of the tall grass which they had gathered, and cook the meal with water. When they learned to cook their food, mankind commenced to be civilized.

Seeing what a benefit fire was to them, they came gradually to believe that fire was the source of all their blessings. The very mystery of it was fascinating to them. It came from the sky; they knew that, for was it not the sun, that golden, fiery ball, that kept them warm during the daytime? And was it not the lightning that brought fire to earth? But

where it had been hiding before it showed itself in the spark that flew from the pounded flints or in the little trailing flame that came at the end of the twirling stick, they could not guess.

As they wondered more and more about the mystery of the fire, they began to worship it, for the Spirit of God which is in all human beings longed to reach above itself and its surroundings toward some greater power. Fire was the greatest friend the earth could give them, because without it they could not have become civilized. But they had an unseen Friend, closer even than the fire, and a giver of greater gifts, for it was He who had given the fire, and He had given also the power to learn how to use it and how to make it.

For thousands of years men worshiped the fire, and the sun and the lightning which seemed to them to be the sources of the fire. But God knew that they were trying to reach Him, and He loved them and helped them, for were they not His creatures? He knew that they were feeling for Him in obedience to the impulse of His spirit within them.

They were like children, those early people, and had to learn so slowly for themselves those things that we are taught by our parents and our teachers. But because they did learn how to live in this wonderful world, how to use its wealth, how to obey its laws, and, finally, how to worship God aright, we are able to live now, the people that we are, with all the blessings that we enjoy.

LESSON 31

MAN'S PROGRESS: THE WORKING HANDS AND THE THINKING MIND

MEMORY VERSE

Whatsoever thy hand findeth to do, do it with thy might.

Ecclesiastes 9:10

The Purpose

The fact that skill of hand helped to develop the mind of man is brought out in this lesson. For the child, as for primitive man, hand work well done stimulates the mind.

Mere increase in physical comfort does not mean a real advance for any individual or any nation, unless there goes with it a corresponding progress in mental and spiritual life.

Suggestions for the Teacher

The teacher should impress upon the class that as soon as the savage men commenced to use their hands to make the articles they needed, they became less and less like savages and more and more civilized, their civilization increasing with their skill. As an application of the lesson the children should be urged to pay attention to their own hand work, that the increase in the skill of their hands may produce a corresponding keenness of their minds.

Interest should be aroused in the children over the

probable fact that the animals and insects taught our earliest ancestors many of their first lessons.

Hand Work

The leaflet offers opportunity for original expression, and variety according to the abilities of the pupils should be encouraged.

OPENING TALK

Let me see the lists you have made of the ways in which people are superior to animals. You have thought of a good many. Now let us think of one of the ways in which the mind came to be so well developed that people came to be civilized beings instead of savages.



WORKING HANDS AND THINKING MIND

Do you suppose that it took those early men very long to notice that their hands were quite unlike the fore paws of the animals among which they lived? A bear can walk on his hind legs and put things into his mouth with his paws, but he cannot move the different joints of his paws. The monkeys' fore paws, which look so much like the hands of the cave men, cannot be used as the cave men learned to use their hands.

Those cave men, like ourselves, had fingers which could be moved as they wished. They were able, as we are, to touch the thumb with the tip of each finger, and that no animal can do. The more those early men tried to do, the more easily their hands and fingers obeyed their wish. The training which they gave their fingers by using them helped to develop their minds. So the more skillful their hands became the quicker and brighter their minds were.


Did they learn to weave by watching the spiders spin their thread and weave their webs overhead in the roofs of the caves? Many times they must have lain on beds of leaves, looking up into the smoke-begrimed roofs where the little spiders were busy making festoons and spreading out their carpets. Spiders had been making webs for millions of years; it would not be strange if they should have taught

mankind. Perhaps, too, from watching the birds weave straw and grass into their nests, those early men tried themselves to plait grass into small mats, just as you learned first, in kindergarten, to plait the colored strips of paper into a little square mat.

In some way those early men and women did learn to plait grass and then weave it. Later they learned to use the fibers of the flax in making cloth. That was a most useful discovery. They have handed it down from generation to generation even to our own time, and we still make from the flax fiber our much-prized linen cloth.

Now when these cave people found what they could do with their hands, and in how many ways they could use the things that were growing about them, they were not content to live in caves as their ancestors had done. They wanted to make homes that would be lighter and drier and more comfortable. Where did they get the idea? We do not know. Perhaps it was from seeing the birds build their nests, or from using some shelter made by trees that had fallen against each other. Be that as it may, the cave men learned to make huts for their homes, placing poles in a circle, one end of each upon the ground while the upper ends met in a point above, much like an Indian's tepee.

When they learned to do this they were no longer like wild men, because they could live in separate families then, not all crowding together in a cave, as many as it would hold. They scattered around in tribes, no longer dependent upon the place where



the cave happened to be, for they could choose any place that seemed best fitted for their homes. By this time they had learned to plant the seeds of the grasses that gave them grain and flax, and some fruits. Then it became necessary that they should live in communities near the cultivated ground.

Some of the peoples made their houses on piles that they had driven into the bottom of the lake. May we not believe that they had seen their little brother, the beaver, at work upon his house in the pond? How could they help wishing to be as safe as he? Don't you suppose it was from the beaver and from the birds that those early men learned to plaster their houses with clay?

Then, later, when they found how hard the clay would become when dried in the sun or baked in a fire, they learned to make dishes of it. Indeed, our own dishes that we call china, and prize so highly, are all made of clay. So from these early people has come down to us the knowledge of making dishes of clay, as well as of making houses, and of spinning and weaving the fiber of flax into cloth.


They watched the beaver fell the trees and roll them down to the water, float them over to the dam or to their house, and anchor them securely in the mud. Their own way of felling trees was almost as toilsome as that of the beaver, for all they had to use were hatchets made of stone. Much patience it must have required to chop down the trees with those rough tools. But those men knew nothing of metal and its uses, and all their implements were made of stone or carved out of the bones and horns of animals.

It is remarkable how many useful tools they made for themselves from these simple materials. They used the antlers of the stag for rakes, or as picks, and parts of them for fish hooks and spears. From their weapons it looks as if the lake-dwellers speared the larger fish in much the same way that the North American Indians did. They carved the horn into drinking-cups, into awls, and even into such civilized articles as pins and needles, combs, buttons, beads and earrings.

Now you are going to ask how we know about these things that were made so many thousands of years ago. Have you forgotten nature's book?

Just as the water at the sea beach buried and preserved the shells and the footprints of animals, so the water of those lakes where the lake-dwellers lived has preserved for us the hunting and farming implements, the household utensils and bits of food and clothing that fell into the lake and were buried in the mud. Such multitudes of articles as those ancient men had learned to make, and so skillful had they become with their stone tools! Think of it, a comb made of boxwood! Pins and needles made of bone!

If, when you were working in your garden, you should dig up an old coin or an Indian arrow-head, would you not look at it with a strange feeling of wonder, knowing that some human being of long ago had lived upon that very spot? So when we open nature's book and see in its pages the combs and the buttons, the needles and pins that some long forgotten people used at their toilet; when we see



the pitchforks, rakes and hoes that they used on their farms, the fruits and grains they raised, the linen cloth they made, the piles upon which they built their houses and the ladders and boats by which they reached them, and even the little toy boats of the children, we know a great deal about these people who lived so long ago.

It seems as if those ancient people needed only the knowledge how to use the bright metals that were in the rocks about them, to become really civilized. In some way they got even this knowledge. They must have learned that secret by themselves, for the animals could not teach them that.

Perhaps the fire did. Perhaps some of the rocks they heated for cooking their food had copper or tin in them. Perhaps the metal softened and changed its shape under the heat of the fire. Then some one whose eyes were quick and whose brain was quick, too, would see that the bright shining substance was softer than the rocks and could be shaped and so used for new and useful objects.

The use of bronze (which is a mixture of copper and tin) for weapons and implements of all kinds began a new era in the civilization of mankind. Then came the use of gold and silver, and later of iron. We owe our present high civilization largely to the use of iron and the steel that is made from it, — that iron which the rain water collected from the rocks, and deposited in a form that we could get; to the coal that was made from the great forests of ages ago; and to the knowledge that has come to us from countless generations of people all trying

to improve on what they had already done, and to learn new things.

What but the Spirit of God implanted in those men, and the loving care of God in helping them to follow that Spirit, could have led them so far along from the state of the early, savage man? With those simple tools, the chipped and sharpened stones, and the fire that they had learned to make, these lake-dwellers had done all this!

It was from beginnings like these of the early men that we have come to be what we are. And as we ourselves train our hands and our minds to make the best use of the materials and forces that are all about us, we shall always be finding new ways and new materials, so that we, too, shall bless all those who come after us to this wonderful world that God has made.

LESSON 32

MAN'S PROGRESS: GROWTH IN RELIGION

MEMORY VERSE

And ye shall seek me, and find me, when ye shall search for me
with all your heart.

Jer. 29:13

The Purpose

To impress upon the mind of the growing child the fact that we grow to be like whatever we look up to or worship, is the main purpose of this lesson, although the quicker growth in civilization because of the social mingling of the different peoples is the subject of the story.

There are two other truths contained in this lesson: the mutual help which men and nations should be to each other; and the danger which comfort in material conditions brings, in shutting away from our lives the desire to reach up to the true spiritual Life that embraces all.

Suggestions for the Teacher

A map of Europe should be used in the class in order that the voyages of the adventurous sailors may be traced from their home city of Tyre to England and on to the Baltic Sea. The countries of Egypt, Greece, Italy and Palestine or Canaan should also be pointed out.

The teacher should make much of the daring, ad-

venturous spirit of the Phœnician merchants, for by so doing she will arouse the interest of the children in them, and so be able, quite naturally and easily, to lead to the thought that moral life and noble ideals must accompany advance in thought and skill. This shows man's progress in religious thought in that most advanced religious nation, the Hebrew people.


Hand Work

The work on the leaflet may easily be done in class. Notice the assignment of home work, and bring maps next Sunday to test its accomplishment.

OPENING TALK

If you were to go from A (your own town) to B (a neighboring city), what ways might you travel? (Train, trolley, automobile, carriage will probably be mentioned.) How long would it take to walk there? If you want to make rapid progress, you will take the quickest way. But the walking trip might make you stronger, might give you many chances to do a kindness to some one on the way. You might learn many things in the slower journey about the country and the crops and the people.

Our story to-day will tell us how people learned more rapid ways of traveling, and so made progress through their commerce and by learning from one another. But to know if they had truly advanced we must ask not only, How fast could they go from place to place? but, What kind of people were they when they got there? That shows why growth in religion — that is, in man's thought and goodness — is a measure of his true progress.



MAN'S PROGRESS: GROWTH IN RELIGION

AFTER men had learned the use of metals they progressed much more rapidly, not only in the arts of building and in making articles for household comfort, but in knowledge of the world and the treasures for their use that it contained. Once having learned how to use the metals, they could not do without them. When their supply was used up they were obliged to search for more.

That meant that they must go about, travel to other places, visiting other tribes and exchanging goods with other people. This was commerce, and commerce, even on so small a scale as that, is a great civilizer. The very need of going about makes it necessary for new methods of travel to be invented. Besides, people who trade with one another learn from each other better ways of living and working. So the discovery of metal helped them in these two ways, by the better implements that they were able to make with it, and by the need to go about to get new supplies.

At first, of course, men traveled only on their own feet. They did not need any help, for they were strong and fleet of foot, and they did not go long distances from their caves or their fires. When need arose, they would carry their burdens on their backs, or upon their heads, or in their arms. But when the

first simple commerce started, there was need of going farther and of carrying burdens that were too heavy even for those strong men.

What made them think of taming animals and training them to carry their burdens for them? How did those ancient men learn that they could catch and tame and harness the swift-footed, wild horses, or the fierce and enormous wild elephants, or the camels or the reindeer? We do not know. Yet in all the different countries men have trained the native animals to be their burden bearers. In many of the countries the burdens are still placed upon the animals' backs, but in the more civilized countries the animals draw the burdens behind them. That means that the people have devised some sort of sledge or wagon, and it means, besides, a cleared road for the wagon to go over.

What do you suppose ever made men think of making wheels and fastening them to an axle so they would turn around when pulled, and so carry the burden along more easily? Yet somewhere the first wheeled wagons began to be used, and somewhere the first roads began to stretch out over the country.

Then some enterprising men, not content to have only their goods carried, wished to be carried themselves. So chariots came into use. The first two-wheeled chariots, set upon an axle without springs, were not comfortable, but they were often gorgeous enough to make up for that lack. It has not been very long that people have ridden in four-wheeled carriages, furnished with comfortable springs; and only quite recently that rubber tires upon the wheels

of carriages and automobiles have made riding so easy and agreeable.

Now with tame animals to carry the goods, roads to travel upon, and a desire for the articles made by neighboring peoples, commerce was assured. After this, civilization progressed more rapidly, because men began to learn from each other and were not obliged to find out everything for themselves. And the different tribes or nations — for people had banded themselves into nations by this time — set to work earnestly to make as well as possible those articles they used in trade. For there was something that the people of each nation had learned to make better than the peoples of other nations did.


Some had learned to make their clay dishes and utensils much better than their neighbors. They learned to decorate them with painted and with raised figures. Other peoples found how to use the flecks of gold they had noticed in the sands of the river beds, and they learned to make such beautiful ornaments that they carried on a regular trade in them. Still others had learned how to use the wool of the sheep and goats that they had domesticated; how to spin it into yarn and how to weave it into firm, warm cloth.

As commerce increased it came to be carried on largely by water. As a result, those peoples who lived along the margin of a sea like the Mediterranean advanced more rapidly than those who could only trade across the land. Dangerous as it was to trust to a water journey in those small rude boats of theirs, it still was not so hard as a journey by land.

The Phœnicians, who lived just north of the place Abraham chose to be the home of his people, early learned to trust themselves to the sea, or, as it says in the Bible, "they went down to the sea in ships." At the time when remembered history begins, and we do not have to depend on nature's book alone for all we know about those who went before us, we find the Phœnicians the greatest traders. Other people, like the Egyptians and the Assyrians, traded between themselves across the desert by means of camels; and in central Europe where our lake-dweller had lived, they probably traded with laden horses. But the Phœnicians put out to sea in ships and went to all the countries that bordered the Mediterranean, carrying back and forth, from one people to another, the articles each desired.

As far as England those small and unseaworthy ships went in their search for tin. This is a rare metal, and most useful in giving the desired hardness to copper. They even went to the Baltic Sea for amber. That was a venturesome voyage for those days. Those were brave men and ready for adventure, or they never would have trusted their lives so far from their home on the frail boats which they called ships. Out of the Straits of Gibraltar they sailed, over a rough ocean to a land of savages, to get the much treasured tin, and far, far beyond to get other things they wanted.

For years and years theirs were the ships that sailed back and forth in the Mediterranean and in the Atlantic Ocean, carrying about to the different peoples many a new idea as well as the articles of



trade. It was they, as we shall see in the next chapter, who carried from Egypt to Greece many of the things which the Egyptians had discovered and used, but which the Greeks made more useful and more beautiful.

The Egyptians were the most civilized nation at that time, but the Greeks possessed the greater souls and the keener minds. Because of their love of beauty and their desire to do and to make everything in the best way, the Greeks became the teachers of the other nations in Europe. To them we ourselves owe much of our architecture, our art and our literature. But it was the Phœnician traders who first taught the Greeks some of the very things that the Greeks themselves improved upon and afterward taught the world.

Now these Phœnicians, although they were so brave and courageous in spirit, and so useful in starting Europe toward a higher civilization than any other countries of the Old World have attained, were not themselves truly civilized. They did not grow as God meant that mankind should grow, and this was largely because they had the wrong thought of God. They believed that He desired human sacrifices. In their mistaken worship they did such cruel and wicked things that they became cruel and wicked in their own lives. All the other nations came to hate them for these traits, and finally they were conquered, their rich and powerful city was destroyed and they were a nation of traders no longer.

One nation there was at that time whose people

worshiped God in ways and with thoughts that made them truly great, because it made their lives truly moral. These were the Hebrews, the descendants of Abraham, whose history is written in the Bible.

You have heard the story of Abraham, how he started out from the land of his fathers to worship, in a new place, the unseen Spirit whom he had come to know as the true God. His people were the Chaldeans, who had always worshiped the sun and fire. They used no image; no temple roof had shut away their rising thoughts from the vast firmament that is full of the evidences of God's work and of His love. Nightly they studied the stars and learned by their devout study many of the laws that govern the heavens.

It is not to be wondered at, then, that a child of such a reverent people should have felt his way to a truer thought of God, that God of whose Spirit we all partake and in whose loving protection we all share. Nor does it seem strange that the people who began so long ago to feel that God is Spirit and that He demands that His children shall offer to Him lives that are pure and good, should be the people who have given to the world its highest religion as well as its holiest leader.

So mankind has grown, reaching onward and upward to a better and a higher life.



LESSON 33

MAN'S PROGRESS: THE WRITTEN WORD

MEMORY VERSE

Let not kindness and truth forsake thee:
Bind them about thy neck;
Write them upon the tablet of thy heart:
So shalt thou find favor and good understanding
In the sight of God and man.

Prov. 3: 3, 4

The Purpose

This lesson which tells the story of the invention and adoption of the alphabet, and its subsequent benefit to the future ages of men, has the purpose of impressing upon the children the importance of thought and of being able to communicate thought; also, that the written thought, if it be worthy and true, lives on to help mankind.

Suggestions for the Teacher

The story of the invention of the alphabet can be made as fascinating as a fairy tale, if read with the right spirit and emphasis; and it ought to interest the children in those words which often, in their daily lessons, have seemed tedious and uninteresting to them.

Let it be impressed upon them that even children become more or less like those companions that they admire; and that the best companions, the best books and the best thoughts will lead them to become better and more useful men and women.

Hand Work

The pupils should be encouraged to attempt the various ways of expressing thought without the use of spoken or written words. The leaflet gives opportunity for the study of picture-writing on a totem pole, and for reading and writing a rebus. If the children should now learn the deaf-and-dumb alphabet, it might sometime add greatly to their ability to do helpful service.

OPENING TALK

How many of you can talk by making signs with your fingers? What do those signs stand for? Letters! But people had words and spoke together long before they had letters to represent the sounds. Can you think of some signs you would make to some one who could not understand English? What motion would you make if you wanted to say river? hill? something to eat?

How people came to have an alphabet with which to write makes our story to-day. When we have finished it we will look at another and earlier way of writing, by pictures and signs, and see if you can make out the rebus on your leaflet.



THE WRITTEN WORD

THERE is one thing that the Phœnicians invented that has made a vast difference to all the world. It is the alphabet.

Did you ever wonder why those little letters that make up our words came to represent the sounds we give them when we read? Before you went to school you never thought of letters when you heard any one talking or when you talked yourself. But when you learned to read, you had to learn the sound of all those letters that make up our written words. For each one represents some sound that we make with our throats, our tongues and our lips, the sounds which form our spoken words.

Savages and uncivilized races have a spoken language, but they cannot read or write. Learning to speak has been a natural growth in human beings, like learning to use their hands, but the art of writing they have had to invent.


Those very earliest men of all could only grunt and make sounds something like the sounds the animals made all about them. Some of those sounds we still make when we are pleased or surprised or hurt. We say, "Ah!" and "Oh!" if we are surprised or pleased, "Ugh!" if we are quite displeased and "Umph!" if we do not care much about a thing; and it was by making sounds like these that the first

men talked together. But when they commenced to think more clearly they found it necessary to talk to others about their thoughts, and they needed more than those simple sounds. So they helped to explain their thoughts with signs that they made with their hands.

That is the sign language, and it is still used by persons who wish to speak together and yet do not know the same language. All children enjoy playing with sign language and trying to see how well they can make each other understand what they are talking about.

Very gradually those cave men commenced to make new sounds as a help in making themselves understood. Perhaps they tried to tell about the different animals they saw in their hunting by imitating their cries. In that way they learned to change the sounds by moving their tongues and lips. This soon gave them words. With words they could say much more than with sounds alone. With words they could give names to the living creatures and all the objects that they saw about them, and when they began to make other words which described people and things and told what they were doing, then they began to have a spoken language.

Now with a spoken language men seem to have been content for a long, long time. They became quite civilized without having known anything of a written language. If they wished to record a fact, they represented it by drawings, as the English found our North American Indians doing when they came here.



All uncivilized peoples use picture writing, for they have never learned any other way. Even those early cave men made pictures. Some have been found in the caves they used to inhabit, and the drawing is done so well that we can easily understand what animals those rough and savage men were trying to represent. They drew, too, with a sharply pointed rock upon bone or ivory, which was a much harder way to draw than your way, with a pencil and paper.

As men began to live in tribes and afterward in nations, they wished to record their deeds; but the only way they had was by this ancient way of pictures. Even such a great and civilized nation as the Egyptians recorded their deeds by picture writing. You must have seen their hieroglyphics in the museums. But you could never imagine what they meant, because their hieroglyphics are not simple pictures telling about simple objects, but long records of many deeds told by mixing pictures with symbols much in the way we make up a rebus. As time went on the Egyptians used fewer pictures and more symbols, and many of the symbols represented sounds; but further than that they never went.


Now, when the Phœnician traders came sailing along in the Mediterranean they found that the Egyptians were far more advanced than any of the other peoples with whom they traded. Being quick to learn new and better ways of doing things, and observing how the Egyptians made their records, the Phœnicians learned to use the Egyptian writ-

ing and to spread this knowledge among the other nations.

But they soon found all those pictures and symbols too cumbersome to use in their trade, and no wonder; for how could the Phœnician merchant in Tyre send a definite order, made out like a rebus, to the miners in the tin mine in Britain. It took too long to make, and it was too hard to read.

Business men could not spend time writing orders that at best were puzzling, even in those long-ago days. So they invented a simpler method. They changed the Egyptian symbols into simpler forms, choosing one to stand for each sound that they made in their words. Twenty-two plain little symbols they made, and these put together in different ways represented all their words. We call such symbols the alphabet. These little symbolic sounds having been agreed upon, the merchants in Tyre could send definite and simple orders to their miners, their traders and their sailors, which would be understood and obeyed. So their business prospered.

Now the Greeks at this time were marvelous story tellers. They imagined that every different thing in nature was the work of some god or goddess. They imagined, too, pretty stories to explain why nature is as it is. They had poets who told these stories and who sang long songs of the wondrous deeds performed by their heroes. But as they had no way to write these things down, they could only preserve them by committing them to memory. Bards went about from place to place singing and reciting the stories of the gods and goddesses and



of the heroes. In this way the tales were handed down from father to son.

When the Phœnician traders came with their neat little letters arranged into written words, you can imagine how eagerly the Greeks seized the idea, and how quickly they adapted those letters to suit their own sounds and words, by dropping some and adding others, as their spoken language demanded.

With their alphabet arranged to represent all the sounds that they made, and grouped to represent the spoken words, the Greeks wrote down their stories and their poems. They became great writers and thinkers, and also great artists. Everything they made and wrote they tried to make beautiful and noble. "Nothing too much" was the motto they went by, and they tried to do everything in a symmetrical way, without exaggeration and without excess.


From telling the stories about the gods who, they thought, represented everything in nature, they learned to love nature itself. They studied the forms in the world about them and tried to represent truly the beauty of what they saw. They thought about the beauty and wonder of the world and how it was made; how it could be helped by good and lovely thoughts and deeds, and how marred by bad and unlovely ones. Their statues are the most beautiful that have ever been made, their temples the finest type of architecture, and their writings some of the best things we have in all literature.

Because of the high endeavor of these Greeks they have become the teachers of all the rest of Europe. Their alphabet it was that the Romans took, and,

having made the letters straighter and simpler, they passed them on to us. The very word "alphabet" which we use is made from the names of the first two Greek letters, alpha, beta.

The Hebrews were another nation that adopted the Phœnician alphabet and changed it to suit their own spoken language. They were of the same race as the Phœnicians, but their worship had elevated them above those neighboring merchant people of Tyre and Sidon. These trading Phœnicians were rich in goods, in gold and silver and tin, in amber and silks and spices; but the Hebrews were rich in thoughts and in their love of the unseen Spirit who "made the world and all that therein is." They knew that He had made them and they tried to find out His will and to do it. They, too, wrote their thoughts, so that, like the Greeks, the Hebrews have given to the world a great literature. It is largely found in the Bible, their sacred book and ours, for it has come down to us from that time long ago when it was first written.

For a long time people have been writing their thoughts, and the world contains many books which tell us the thoughts of others. These may be a great help in our lives or they may do us harm, according as the thoughts of the writers are noble and high or low and unworthy. Books can be good friends or they can be bad friends. When we choose the best books to read we are filling our minds with the best thoughts. When a good book is written it lives on and on, often influencing the minds of generations of men and women.



LESSON 34

THE STORY OF STEAM

MEMORY VERSE

Let the favor of the Lord our God be upon us;
And establish thou the work of our hands upon us;
Yea, the work of our hands establish thou it.

Ps. 90:17

The Purpose

This lesson is given to open the eyes of the children to the extraordinary use man has been able to make of such comparatively simple things in nature as rocks and water. That these things always existed on the earth with the same laws that they have now, and only awaited the thoughtful notice of man to become his most useful servant, is the special lesson to be drawn.

The prayer in the memory verse may well be used with the thought of man's many inventions in mind.

Suggestions for the Teacher

The story of the progress of mankind is here brought up to modern times by the story of steam. The children should be made to realize how simple a thing steam seems to be when looked at without thought; and yet what an extraordinary force it has proved to be because it was looked upon with thought. The lesson that the common things often bring the greatest blessings will be repeated in other forms. It should be impressed upon the child's mind.

How rapid man's progress has been in recent times will be understood even by young children when they realize that every mile of railroad in the world has been built since 1814. The same thought may be carried into the next lesson and applied to electrical inventions.

Hand Work

Encourage the pupils to think out for themselves what they shall write on each of the topics suggested on page 4 of the leaflet. Let one member of the class tell the story of Watt and the teakettle when the work is inspected the following Sunday.

OPENING TALK

What moves a railroad train? What moves the engine? Can you think of a world in which there are no trains of cars? It is not so long ago that just such a world as that was the one people had always known. The genius of one man brought about this great change, and the substance that he used, water, was the one which has done so much to make over our world.

THE STORY OF STEAM

By the time the alphabet was invented and the most advanced nations along the Mediterranean had begun to use it, they had begun to use iron also. With the use of the sharp iron implements the skill of the people became greater and greater, and as their skill increased the quickness of the mind increased also. They began to inquire more and more into the nature of those mysterious forces which they could feel and use but could not see. In this way the race of mankind had been going to school. Nature had been the teacher, and they learned well the lessons she was trying to teach them.

The cave man, partly covered with a lion's skin, would not think much: for he did not know much. Even the lake dweller, dressed in a coarse linen cloth, would only look out over the lake and wonder what luck he would have in his fishing the next day.

But the civilized and cultured Greek, dressed in a closely woven tunic of the softest wool, would look about him with seeing eyes and with a busy mind. As the rays of the setting sun fell upon a plant of honeysuckle growing near him, he would see what a graceful decoration it would make about the base of a golden bowl, and he would use what he had seen to make more beautiful the common things of daily life.

The Hebrew shepherd would look up into the clear vault of the heavens and watch the stars come out one by one, until the night was wondrous with their clear and sparkling light. But his inner eyes would see beyond the stars, and his spirit would feel the nearness of the unseen Friend, the Maker of it all.

So by thought, which written language has preserved, mankind has grown. All the great ones who ever lived have become great because their thoughts were busy upon things of importance, and their eyes looked searchingly into the truth of God's creations. They became inventors and discoverers, poets and prophets.

Now as the discovery of iron and the invention of writing sent those early nations that learned to use them so far ahead of the others, and as the invention of printing has helped still more, the use of steam has also given the civilized world another great push forward, by making it possible to do much more than could be done in any other way. Through the use of steam articles of daily need, such as our clothes, our furniture and our dishes, and books containing the thoughts of great men, can be manufactured by machinery in great quantities, and so cheaply as to come within the reach of all. Because of steam, too, commerce and travel are made so much easier that people of different nations not only send to each other great quantities of goods, but travel about, visit each other, see the different countries, and so become more highly developed.

Just as the people about the Mediterranean Sea became most civilized through their commerce and

their travel, so the great ease with which steam enables the trading and traveling of the present day to be done, has advanced the nations of the whole world.

Useful inventions made in one country are procured and used in other countries. Never a book is written but may be translated and sent to all other nations. Because of the ease of manufacture all the people may now have the books and comforts that only the well-to-do could procure a century or more ago.

Now the ancients knew about steam, and used it in ways to frighten or amuse the people, but it was centuries before the thought of one man found a way to put it to practical use.

You have all heard how the boy, James Watt, used to amuse himself watching the steam come out of the nose of the teakettle and seeing what it would do. His eyes were quick to see that the steam lifted the lid of the teakettle, because steam filled a great deal of space and wanted to fill more. He also saw that that same space-filling steam could be reduced to a few drops of water again as soon as it was chilled.

In after years the thoughtful play of his boyhood helped him to invent an engine that would harness steam to do work that it would take thousands of people and horses to do. This boy, who used to spend his playtime doing mathematical problems, watching steam, making experiments in chemistry and constructing useful machines, became such a benefactor to the world as few could ever hope to be. He invented the steam engine.

Although Watt and all his friends knew, at the time, that his invention was very important, they could never have dreamed what great changes would come because of it. When he first invented the steam engine it was used to do work in just one place, that is, it was a stationary engine. After a time some one thought to have the engine itself move as it does now in the railway locomotive. Watt himself had said it could be used for that purpose. He lived long enough to take a trip on a steamboat, and to hear that some one was trying to use his engine for a steam carriage. Whenever you see a railroad train you will think how well that attempt has succeeded.

The stationary steam engine, with its appliances, does the work that the hands of men, women and even children used to do in mills and factories; the steamboat makes travel upon water faster and safer; and the steam locomotive draws a load a thousand times heavier than strong horses could draw, and does it with much greater speed.

Now what is this steam which people had known about for so long but which the thoughtful young Watt discovered could be harnessed to do most of our work?

You remember, do you not, that it is another form of water? It is water heated so hot that it evaporates rapidly and fills a much larger space than it did before. So that very same water, which does such a work in making over the surface of the earth, and changing about the minerals hidden in the ground, is, when turned into steam, harnessed by man and used to help him in his work.

Iron, coal and water are three most useful servants working together under man's thought and direction, enabling him to do great things. Without coal, the great iron and steel engines could not be made, nor could there be water enough converted into steam to fill them.

Rocks and water, such common things, yet what use we make of them! What a power to help is the black metal in the rocks; the black, glistening rock that will burn; and the water that is so abundant on our earth.

Do you not suppose that the world contains many more gifts as useful, if we could only find what they are?

But that is man's duty, to search throughout the world with seeing eyes and a reverent mind, looking for the gifts God has given to us in nature, and for the laws which enable us to understand and use them.

LESSON 35

THE STORY OF ELECTRICITY

MEMORY VERSE

Ask, and it shall be given you; seek, and ye shall find; knock, and it shall be opened unto you: for every one that asketh receiveth; and he that seeketh findeth; and to him that knocketh it shall be opened.

Matt. 7: 7, 8

The Purpose

That the treasures with which God has filled the world are here waiting to be used and can be found by the earnest seeker is a lesson well adapted to the questioning minds of children from nine to ten years of age. The added truth that God bids us seek is the special purpose of this lesson.

Suggestions for the Teacher

The lessons to be drawn from the story of electricity are much the same as those from the story of steam. Here, however, stress should be laid not only upon the fact that the laws have existed from the beginning, but also upon the truth that what we earnestly search for we shall find. The teacher should provide herself with one of the sets of articles to be rubbed, which is given in the list of the handwork, and show the children how the electricity was obtained that amused and interested people for so many centuries.

Hand Work

The children are to try as many of the experiments given on the list as possible, putting a cross beside the names of those objects they have electrified.

OPENING TALK

You may each tell me how many things you have in your homes that employ electricity. Can you remember when your family first owned and used any of these?

How men thought and asked questions of nature until they found out how to store up electricity, and how many ways they have found of using it make a real story.

THE STORY OF ELECTRICITY

FOR a much longer time than they had seen steam, people had seen lightning, but they did not know what it was or how it came to be. They thought that it was sent to the earth by an angry god, who used it to show his displeasure. Even such civilized nations as the Greeks and Romans believed that, and they represented their principal god, Zeus or Jupiter, as holding the thunderbolts. The Hebrews thought thunder was the voice of Jehovah. Later on, when people became Christians, they still looked upon the lightning as something mysterious and not at all to be explained or understood.

None of these people ever dreamed what the lightning really was. Little did they think that the peculiar power which they had noticed in amber when it was rubbed was the same power that made the flashes of lightning. Most of the ancient peoples were acquainted with amber and they had noticed its peculiar qualities. As early as the beginning of their trade, the Phœnician merchants used to carry amber to the different cities around the Mediterranean. The Greeks named it "electron," or, "the shining thing," and they made up a beautiful story about the pieces of bright amber. They said that they were the tears of the sisters of Phaëthon. Have you ever heard the

story of Phaëthon, how he drove the chariot of the sun?

Now, amber is really pitch, — pitch that fell from great pine trees that grew long before man lived upon the world. Whenever these pine trees grew near the shore, the pitch, dropping into the water, or being washed into it, was covered over and so preserved for us in nature's book. But the Greeks knew nothing about that, they only knew that it was a strange substance. They thought that it must have something to do with a god; for, when they rubbed it to polish it, there seemed to be something alive in it, — something that would reach out and take hold of little particles of dust or straw and draw them to itself. The little particles sprang to it and stuck for a moment to its sides.

Did you ever rub an amber bead on a piece of woolen cloth and see how bits of paper would fly to it? If you do not have amber, use a rod or plate of glass, a stick of sealing wax, or a rubber comb. Have you ever seen your hair follow the comb some cold winter day, or made sparks come by scuffing across the carpet and then touching some one with your finger tip?

As people came to see more and more of such strange effects from different substances, they studied into the matter until they learned to collect this amazing something in such quantities that it could be stored away and kept.

It is no wonder that the Greeks could not explain what they saw. Indeed, it has taken thousands of years for men to find out what a strange power it is

that makes the amber act as it does when rubbed. We call that power electricity, from the name the Greeks gave to amber; but, although we know how to produce it, how to store it and how to make it work for us, we do not know even yet what electricity really is.

Now, while people were trying to learn more about this extraordinary power to which they gave the name electricity, there was a man living in America who made an important discovery. His quick eyes told him that the jagged flash of light, which leaped through the air from one to another of those surfaces that had been charged with electricity, was just like a flash of lightning. He determined to find out if it could be true that the lightning, one of the greatest mysteries of nature, could be caused by the same power that made the tiny flash or spark in the electrical instruments men had been making.

So this man, Benjamin Franklin, went out of doors when a thunderstorm was coming on, taking a silk kite that he had made and pointed with wire, a silk ribbon which he tied to the cord of the kite, and a key to hang upon the ribbon. With these he hoped to coax the lightning out of the sky and bottle it up in a Leyden jar.

You must have heard the story, and know that he succeeded in proving to the world that the mysterious lightning was electricity, not an unknown thing to be feared and dreaded, but a force of nature that, like everything else, had laws of its own to follow.

The story of electricity is even more marvelous than that of steam. We have come to depend upon it in our daily life, and remarkable are the things that it will do. Men have discovered how to collect electricity, how to store it and to measure it. They learned too what wonderful things it can do when it is harnessed in the right way. Each new discovery about the laws that govern it, each new invention of a way to make a practical use of it, has helped to bring about even better ways, for many wise men are using all their thought to find new uses still for this invisible servant.

Have you ever seen a telegram handed in at the door by a messenger boy? Do you know what that telegram really is, and how the words came to be upon that slip of paper? Or how do you think it happens, that when we talk through the telephone we can hear our friend's voice so distinctly? And what is it that makes it possible for us to hear the voice of a great singer coming out of the phonograph? It is electricity that does all these things, but electricity held in control by the inventions of men who have studied its nature and its laws.

We are quite used to seeing wires stretched across poles and we know well that those wires carry electricity. We know, also, that wherever those wires go, into a factory, into a station, or into a house, the electricity which the wires carry will be made to do some work. Have you ever thought much about those wires and the electricity that is traveling along them?

That little box by your telephone holds a machine




that is the result of the thoughts of generations of men, who have been ready to give up their own comfort and ease in life, in order to search out new laws in nature, and apply them for the benefit of mankind. Some of these have thought of new things that could be done, leaving others to find the way, — just as Watt said his engine ought to be able to move a carriage, but Stephenson found the way to make it do so. Many other men have seen in a flash with their mind's eye some new way to use an old discovery.

As iron and coal must be used with steam to make it the useful servant it is, so electricity could not be what it is to us unless we had learned the use of certain metals and minerals, such as iron, copper, platinum and carbon. It is no longer a plaything merely, as it is when we rub amber or rubber to get its effect; not something frightful, as lightning once seemed to be. It is one of the great workers of the world.

Perhaps we shall not always need in making electricity just what we need at the present time. Probably thinking men from year to year will find new ways that are simpler and better. Perhaps some boy or some girl, who hears or reads these words, may find an easier, quicker way to do something that we now look upon as quite wonderful.

Samuel Morse, who invented the telegraph, and Alexander Bell, the inventor of the telephone, thought that electricity must always travel over a wire if messages were to be sent by it; but Marconi, the Italian inventor, has found that he can make



machines that will send and receive messages without wire. It is not so long ago that Marconi, then almost a boy, startled the world by sending across the ocean his first message through the air. Now, one ship in trouble can be helped out by the other ships that receive its "wireless" messages of distress sent through the air.

A person living in the world to-day can receive in a few moments a message by telegraph from a friend living more than a thousand miles away. He can talk by telephone with a friend who lives even three thousand miles away. He can send home a message under the ocean by cable, if he is traveling in Europe; and he can even send word back to his family when he is in mid-ocean, telling them that he is safe and well.

He can travel on trains that go so swiftly it takes our breath away to watch them; he can travel on electric cars or in an automobile. He can cross the ocean in great safety and comfort in a swiftly moving steamship; he can even travel under the ocean in a submarine, and in the air in an airplane.

Does it seem as if more than this could be done? Yet nature still beckons to the mind and to the seeing eyes of mankind. She has many more secrets to tell to those who desire to learn them. Many of the boys and girls of to-day will join the ranks of those who, by their thought and devotion, have benefited the lives of all mankind. It was only a short time ago that Marconi was a boy, and think what he has done!

Nature has a reward for every diligent searcher after her truths. Did not Jesus say, "He that seeketh, findeth; and to him that knocketh it shall be opened"?

LESSON 36

SEARCHERS AFTER NATURE'S TRUTHS

MEMORY VERSE

Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time.

H. W. Longfellow

The Purpose

This lesson serves as an introduction to the three lessons on astronomy and also as a suggestion to the children of the marvelous power that God has given to the mind of man. The nearness of God to man, leading him ever onward through his mind and soul, and helping him in that way to help the world itself, is the special lesson to be given the children.

Suggestions for the Teacher

This lesson should be given in such a way as to awake the child's interest in thought itself — the thought that is able to prove things true that we cannot see or touch or feel. It is a difficult subject for their comprehension, and yet it is felt that their minds can take the mere suggestion of it that is given here. If the lesson is given to them in the spirit of wonder, they will learn to look with wonder toward the God-given mind of man.

The brief accounts of the three great discoverers help make the subject concrete.

The opportunity to awaken international interest, because Poland, Italy and England gave these great men to the world, should not be missed.

Hand Work

Many pupils will need assistance before making the lists called for on the leaflet. Let the preparation be a class interest, each sharing with the rest his present knowledge of inventors or discoverers, the teacher suggesting the names of one or more about whom they may learn.

OPENING TALK

Name some of the great men our own country has produced. We know of these because they lived in our own land and spoke our own language. But many lands have produced great men, and in time, no matter what language they spoke, their thoughts and discoveries have gone all over the world. Our story to-day is about three of these, from three different countries, whom we shall want to remember.

SEARCHERS AFTER NATURE'S TRUTHS

THE great men who have taught us the uses of steam and electricity are only a few of those who have spent their lives in searching to learn the laws of nature, those laws that God has given to the world, and to know those things that make up the world, whether gas, or rock, or plant, or living creature, or an unseen force.

At first all men thought the earth was flat, because the little we can see at one time looks flat. They believed that it was surrounded by a mighty ocean into which the sun sank at night, and out of which it rose again on the other side in the morning. They saw the sun and the stars rise in the east, move through the sky, and sink out of sight in the west. Why should they not believe what they saw?

Most of them rested content with taking things to be just what they appeared to be, but some questioned and wondered. "What is the world?" they thought. "What is the sun, and what are all those myriads of stars, which flash and twinkle through the nights, and which seem to change with the different seasons?"

They noticed that the sun did not seem to travel through the sky along the same path among the stars month by month. In the winter it was much nearer the horizon than it was in the long, summer days.

The moon, too, was always changing its position, sometimes traveling low, sometimes high. They noticed that it changed its shape from day to day, from a thin crescent into a round, full moon, then changing back, until in twenty-eight days it would begin again as a narrow silver crescent in the west. You see it change in this way yourselves.

All those things they pondered over, until some whose eyes were keen to notice the things in the world as well as those in the sky, and whose minds were keen to think about what they saw, concluded that the world must be round like a ball. But they still thought of it as fixed in space, with the sun, moon and stars revolving about it. They believed that the world was the center of all things; and when they noticed that the stars did not seem to change their positions in regard to each other, they thought that those twinkling stars must be fastened to the dome of the heavens, which itself revolved around the earth, carrying the stars with it.

Men thought this for hundreds of years. If you had lived then, you would have been taught just what the rest believed. But you might have been one of those who saw more clearly than the others, and could not believe in a fixed earth with a revolving dome above it. You might have wondered about it, and tried to understand it better.

That is just what Copernicus did. He was a searcher for truth who was born in Poland. He watched the movements of the sun, the moon and the stars, and after thinking about them for a long time he announced to the world that the sun was the

center of the solar system, and that the earth did not stand still, but moved around the sun as did all the other planets.

"What makes the sun and stars seem to move around the earth," he said, "is that we are moving. It is just the same if you are riding in a carriage. The trees and houses seem to go past you in the opposite direction from the way you are going. You know they do not move, it is you who are moving. In the same way it is the motion of our earth itself which makes the stars seem to move around it."

Great was the consternation created in the world! Such a thought was wicked! It could not be believed! "How could it be possible," men said, "for our earth to be anything but the center of the universe? Was it not made for us, and was not the sun made to warm us and light us by day, and the moon and stars to give us light by night?" So in their self-importance they would not listen to the thought of that great searcher after truth.

The book in which Copernicus set down what he had found was printed and placed in his hands just before he died. Some people read it and believed what it stated. One of these was Galileo, an Italian, who was born in Italy just twenty-four years after the death of Copernicus. He heard that the Dutch had found a way to make distant objects look nearer by using lenses. He grasped the idea at once and made his first telescope. With it he searched the heavens for more knowledge of the sun, moon and planets. How Galileo has opened the eyes of man-

kind! What wonderful things men have been able to do and to learn because he showed them how to see into space!

Did you ever look through an opera glass or a spy-glass and see how near it seems to bring a distant object? Perhaps you have had the good fortune to look through a telescope at the moon, and to have seen some of the mountains and valleys that Galileo first saw upon its surface and told the world about. There are much larger telescopes now, and they bring those distant orbs much nearer to us than the small telescope of Galileo could; nevertheless, he showed us the way to see beyond the world we live in, and to see understandingly.

By studying the sun and the planets he was convinced that Copernicus was right in saying that the sun was the center and the earth moved around it, and he boldly proclaimed this in his teaching. For daring to state, and for trying to prove, this new truth, so different from what was generally believed, Galileo was persecuted and put in prison. But his statement was true, and in time everybody believed it. Those people who opposed Galileo could not stop the progress of knowledge, for all their trying. "Truth is mighty and shall prevail," and the truth about the revolution of the earth around the sun did prevail. What Copernicus discovered and Galileo proved with his telescope is now taught to boys and girls in the schools of all civilized countries.

There is one more of these searchers after truth who discovered a great law of our universe and whose name is associated with that of Copernicus and

Galileo. It is Sir Isaac Newton, who was born in England the very year that Galileo died.

Perhaps you have heard the story of Sir Isaac Newton sitting under the apple tree, and asking himself the question any child might ask: "What makes an apple fall to the ground?" And this searcher for truth thought about that falling apple and other motions of bodies on the earth and of the planets out in space, until he found an answer. He said there was an invisible force everywhere pulling particles of matter toward each other, moving smaller bodies toward larger ones. This force he called gravitation. He knew that if he was right about the pull of that force, he could prove it from the movement of the moon around our earth, and of the planets around the sun.

Do you think that was easy to do? Oh, no! Even after his keen mind had thought out a reason for what he saw, Newton had to work very hard to prove his law. He covered whole pages with figures. How long do you think his patience lasted? One year? Two? Three? For seventeen years Newton kept on thinking and trying, and still he had not proved what he believed to be true.

One day he heard that another scientist had found a new measurement for the curve of the earth's surface, more accurate than before, which would give a different number for the mass or weight of the earth. Newton hurried home, put that new number into his pages of figures, worked his long problem all over again; — and this time it was right. He had proved his great law of gravitation, and helped people to

understand the mighty unseen force which keeps each planet in its course, and holds all the vast systems of suns and worlds to regular paths and orbits.

These men, and those who came after them, who spent their lives searching for truth, have found how the earth and the planets move, and they can tell just where in the sky they will be at any time. You have only to see a page of the neat little figures with which these thinkers calculate the orbits of the planets, to be filled with wonder at the power that God has given to the human mind; for these men have gone beyond the world with their thought, and they have proved the truth of things that they can neither touch, nor feel, nor see.

They seem so far above ordinary mortals that we look up to them with amazement; they seem like different beings from us. But no! They were children once, looking just like ordinary children. Some of them were delicate and sickly; some were poor, so poor that they had to work hard at their daily tasks before they could begin to do the work they loved and dreamed of day by day. Some of them were well educated in the schools, but others gained by themselves from books and experiments that knowledge which led them on to success.

Many of these boys had mothers whose love and ambition for them made them what they were. Some had sisters, daughters, and nieces, without whose patient and loving help they could not have succeeded. And many of these wonderful minds belonged to women: Maria Mitchell, the astronomer,



and Madam Curie, who discovered radium, are among the number.

So God blesses the world of men and women through the men and women themselves, — the men and women who were once children. In every child, then, lies the possibility of becoming one of those world helpers; and every child, whether or not he becomes himself a discoverer of new truth, may learn to keep an open mind to receive the discoveries made by those who are searchers after truth.

LESSON 37

GOD'S GIFT OF SUNLIGHT

MEMORY VERSE

There is one glory of the sun, and another glory of the moon,
and another glory of the stars; for one star differeth from another star
in glory.

1 Cor. 15: 41

The Purpose

These lessons on the heavenly bodies (37-39) follow those which relate the progress of mankind as a natural sequence, because they give the results of the power of thought to which man has attained.

They can do little more than to awaken in the minds of the children wonder and amazement at the vastness of God's universe. But a reverent wonder aroused in childhood over the heavenly bodies will ripen in later years to a breadth of mind which of itself will insure truth-seeking.

The religious purpose of this lesson is to acquaint the children with the vastness of the system to which our own wonderful world belongs, and to show them that it is because of the power of God's spirit dwelling in each one of us that the truths about these worlds beyond us have been revealed.

Suggestions for the Teacher

The teacher should be prepared with some known distances to be used as an illustration of the different measurements given. If possible show the children how

an opera glass is constructed, how the lenses are inserted in the tube, the convex lens at the back and the eye-piece at the front. The opera glass is the same form of telescope that was used by Galileo.

The children should be made to realize as much as possible the immensity of space which the telescope has opened up to us; and the knowledge that the prisms have enabled us to obtain of those other vast suns that appear to us as points of light.

Hand Work

If possible, have the pupils study light through a prism before attempting to do the work asked for on the leaflet.

Interest in the Bible passages about the sun may be aroused in class. Remind the children of certain incidents and verses they know already which mention the sun: (1) in the story of creation, (2) in the parable of the sower, and (3) in the story of the transfiguration. Do they know where to find these in the Bible, and how to write the abbreviations for the books, and the chapter and verse when found? A little class teaching and practice on this use of the Bible may be needed. Then the pupils may like to look through a single book, like Psalms or Ecclesiastes or Revelation, to find how many times the sun is there mentioned.

OPENING TALK

Shall we repeat together the memory verse for this lesson? A glory indeed is the bright shining of all these heavenly bodies. Let us name them again (sun, moon, stars). Which is nearest our earth? Which gives us the most heat? The most light? Our story to-day will tell you about God's gift of sunlight.

GOD'S GIFT OF SUNLIGHT

Do you remember what a great change came over our earth when at last the sun pierced the thick fog and began to shine directly upon it? What is the sun, that it should have made so much difference in the condition of the earth's surface? What does it still do for our world?

The first people who lived on the earth must have noticed some of the things we see: that when the sun shines, its beams are warm, even hot in summer; that night comes when the sun disappears below the horizon, and that the night is cooler than the day.

They noticed, too, that the sun must be far away, because it was beyond the clouds, which seemed quite far off themselves. In time they observed that the sun seemed to change its course at different seasons, sometimes climbing high up in the sky and pouring down hot rays, sometimes going much lower and sending down slanting rays that seemed to warm the earth very little. Probably it took a long time for those early men to see the relation between summer's heat and winter's cold, and the position of the sun in the sky. They became used to the changes and took them for granted, just as you children do.

But there came a time, as it comes to you, when

they began to ask questions about these changes and what the sun had to do with them. You can ask some one who knows, but they could not. They had to think out answers for themselves.

Many long ages it has taken men to answer these questions. They have felt their way along, making many mistakes, yet always coming nearer and nearer to the truth; for was not the spirit of God leading them on?

The thinkers came to believe at last that the earth was round like a ball, but it was centuries before a daring Portuguese mariner started out to sail entirely around our globe. One ship of the expedition succeeded in sailing around and coming back to port. Then people knew that, indeed, the earth must be round.

"If the earth is round like a ball, the other heavenly bodies must be round also," said the thinkers. But, until Galileo made his telescope, no one could prove it. When he looked at the moon through the leaden tube in which he had placed the two pieces of lens-shaped glass that he had made, he could see that it really was round. With larger and larger telescopes the men who have searched the starry sky have discovered many wonders in the universe. Do you think those searchers of the sky were eager to find out about the sun, what it really is, what makes its light and heat, and how far away it is? Indeed, many men have spent their lives trying to learn more and more about the great orb upon which the world itself and everything on it depends.

You shall hear some of the truths that they have

learned. You would not understand it all — none but the great thinkers themselves can do that — but even a part of what they have discovered is a wonderful story.

This, then, is the story of the sun.

It is an immense ball of glowing light, so large that we cannot picture to ourselves its size, and so far away that we can hardly imagine its distance, for there is nothing upon the earth with which to compare it. It may help us to get an idea of its distance to think how long it would take one of our fastest express trains to get there — those trains that take away your breath when they dash by you.

It would take — now put on your thinking caps — it would take about one hundred and seventy-eight years for that express train to get to the sun, going straight on and never stopping an instant. That is twice as long as a very old man lives. That same train, traveling at the same rate of speed, could go around the equator of the earth, which is its largest part, in seventeen days.

Just think of it! To be only seventeen days going around our great world, but one hundred and seventy-eight years on a journey to the sun!

Can you think how far that would be? Or, can you think how much larger the sun is than our world, when you hear that this sixty-mile-an-hour express train would require five years to go around the sun?¹ There is a great difference between seventeen days and five years. Why, you are only about twice five years old, and it is a long time since you were a

¹ Figures given by Dolmage.

baby; but seventeen days go by very quickly, they are even fewer than the days between Thanksgiving and Christmas.

To this immense globe, the sun, that is so far away, we owe all our light and heat. "How can the light and heat reach us when they come so great a distance?" you ask.

Ah! that we do not know; it is still a mystery. It is one of God's laws that we have not yet discovered. Men have a way of explaining it by saying that it comes on waves of ether, but what ether is no one can tell. But you do know that some of the sun's heat does get here, if you remember one of those hot days in summer when the sun would have blistered your skin if you had remained out in it long.

Yet they tell us — those searchers of the sky — that "only about one-hundred-millionth part of the sun's heat is caught by all the planets together"; and there are seven other planets besides our world. Now that is something that our minds cannot grasp at all! Try to picture to yourself a huge bonfire in an open field, with eight children scattered here and there within a circle five miles across. How much of the heat of the bonfire would each of you children receive? The one nearest the fire would feel its heat the most. The child who was one-fifth of a mile away would seem to get but little of its heat, yet that child would represent the earth's distance from the sun. It is quite easy to understand, then, that the heat which comes from the sun is very much greater than the heat which comes from any fire that we could possibly make.

As for the light we receive from it, who can ever look at the sun when it is shining brightly in the sky? Have you noticed how feeble and dull even the brightest electric lights look in bright daylight?

Now the heat and the light that come to us from the sun are the very things upon which the whole life of the world depends; yet what causes this light and heat has been a study to many great men. Wonderful inventions they have made, trying to find out, if possible, what is in the light of the sun, and much has been already learned about the quality of that light, and about the sun from which it comes.

You know what a rainbow is, for you have been taught at school. It is the beautiful, white light of the sun divided into its seven principal parts by the drops of falling rain. You can divide a sunbeam into its seven rainbow colors yourself with a prism of glass.

What a simple-looking object a three-sided piece of glass is, yet with that simple device men have discovered a great thing, — that the white light of the sun is made up of the seven brilliant colors that we see in the rainbow.

Men have discovered also by means of these prisms of what the sun is composed, what makes its heat and its light, and even which side of the sun is turning toward us. They tell us that the sun is an immense ball of burning gases, and what those gases are. For by a combination of prisms they spread out a beam of white light into a band of colored light crossed by dark lines. This they call

the solar spectrum. Then they burn the different minerals which make up our earth, and taking the spectrum of these and of different gases have compared it with that of the sun. In this way they found that the sun contains some of the same metals and gases, such as iron, copper, platinum and hydrogen, that we know on our earth.

In the same way, by a combination of glass prisms, they have made the light that comes from all those distant stars resolve itself, and tell us of what they are made. A great secret those stars have given up, — those stars so much farther away from us than even our own sun. It is nothing less than that they themselves are suns, and that our sun is a star!

Just with glass, which is made from such a common thing as sand, have these wonders been discovered. But the hand of man first shaped the glass, and the thought of those who searched deeply and reverently into nature's secrets helped to explain what was seen.

It is by the eager search, continued through centuries, that people have learned about this vast universe of which our world is a part. And all that we learn makes us more reverent, more willing to trust God, more eager to learn His real purpose for our lives.

LESSON 38

THE SOLAR SYSTEM

MEMORY VERSE

When I consider thy heavens, the work of thy fingers,
The moon and the stars, which thou hast ordained,
What is man, that thou art mindful of him?
And the son of man, that thou visitest him?

Ps. 8: 3, 4

The Purpose

The religious lesson to be given from this story of the solar system is that the children of God should have no fear or dread of the forces of nature. When we seek to learn the truth about these forces we are set free from the fears that ignorance causes.

Suggestions for the Teacher

Talk of the members of our solar system as near neighbors in the sky. The children will then begin to have a feeling for the friendly stars which may be carried over in the next lesson to the more remote fixed stars or suns.

Use Bible references like Ps. 19: 1 ff. and the memory verse to show how even in remote times men were impressed with the wonder of the heavens and moved to worship at sight of them.

Hand Work

The teacher who has planned in advance may direct the children's observations of the moon for a month be-

fore the work required on the leaflet is done. It will not be necessary to tell them this lesson story before they make their observations.

OPENING TALK

How would you like to live on a star? Well, you do live on one, the kind of star called a planet. What other stars there are like ours, all part of the sun's family, and how the moon belongs especially to our star the earth, you shall hear to-day.

THE SOLAR SYSTEM

LONG ago Syrian shepherds, keeping watch over their sheep in the quiet of the night, used to gaze at the myriads of stars that twinkled down upon them with a friendly light. They loved these stars as if they were friends, for they were the only companions the lonely shepherds had during those long, dark nights. They had noticed the way the stars are grouped in constellations, and they watched from night to night to see when the same group of stars would come above the horizon and swing up into the sky. To some of the brightest stars they gave names, and they learned just when and where to look for them, and for the constellations of which they made a part.

Among the brighter stars they had observed some that were not always to be found when looked for. These changed their places from time to time, and did not seem to stay long with the same set of companion stars. So they called them planets, which meant wanderers.

For a long time men did not know what the planets were, or why they acted in such a different way from the other stars. Still less did they suspect that our earth, on which we live, is just another one of these planets. But we know now that the planets are worlds, as is our earth, and shine by reflected light like

the moon; while the real stars are suns, shining by their own glowing light.

These worlds, or planets, all revolve around the sun, and from the sun they borrow the light with which they shine. They make up a sort of family which we call the solar system. The sun is in the center and around it revolve the eight planets. Mercury comes first, almost hidden by the sun; then Venus, like a great lamp hung in the sky. This is the beautiful evening star that you sometimes see low down in the west after the sun goes down. Then part of the year it is the morning star, and shines in the east before the sun rises. Our earth comes next, carrying the moon with it in its journey round the sun. Then, in order, are the red planet Mars, the splendid Jupiter, and Saturn, which shines with a yellow light. Then comes Uranus, quite lost among the smaller stars, and last of all Neptune, not to be seen at all excepting with a telescope.

All the planets except Mercury and Venus are known to have moons. Could you think what our sky would look like if there were eight moons to be seen at night? The eight moons that both Jupiter and Saturn have, or the four that go around Uranus, would make our midnight sky almost as bright as day. Even the two moons of Mars would seem quite a sight to our eyes, especially since one of them rises in the west and crosses the sky in just the opposite direction from all the stars and the other moon.

But there are stranger things to be seen upon these planets than just a moon seeming to go the wrong way, for Saturn is surrounded by three rings. That

is a thing so singular that we are at a loss to imagine how our sky would look if those three great rings belonged to our world.

Jupiter, the largest of all the planets, is surrounded by a thick, dense fog. It is warm, quite warm, by its own heat, as if it were now going through the same changes that our earth went through when it, too, was so warm that the dense fog lay close and heavy all about it. It is partly from what they see of these other worlds, that the searchers after truth can tell us what our world is like. Is it not strange that we can look up into the sky and learn what our world really is, and see other planets going through the same stages that our earth passes through? The wonderful telescopes through which they look, the carefulness with which the scholars observe, and the wisdom with which they think upon those things have all brought us nearer and nearer to some of the great truths of God's universe.

Supposing, now, that some one living on one of the planets could look at our earth, what would he see? If he were as far away as Venus he would see a steadily shining star like those we call the planets. If he were upon the surface of the moon he would see a glorious orb which would flood the moon with a silvery light much brighter than that the moon gives us. When our sky was clear and the sun was shining brightly upon the earth, that "someone" on the moon could see the markings of our continents as plainly as we see the markings on the face of the moon.

While the moon's face is always bright to us unless




our clouds hide it, the moon has no clouds in its sky, no atmosphere for them to float in, no water upon its surface to make them. The moon is an old world. Its face is wrinkled and marked with many mountains, all of them sharp and ragged. There is no running water to smooth the sharply wrinkled surface; no trees or shrubs to make it beautiful; no air to soften all the outlines and temper the fierce glare of the sun, which shines steadily upon it.

Yet once, they tell us, there was water upon the moon, for the dried-up seas have left their marks. Those are what make the pictures that we see in the moon. Some see a man's face; some, a man shooting; and some, the face of a woman with hair rippling over her shoulders. But when we look through a telescope or even through an opera glass, the man's face and all the other pictures are seen no more. We see instead vast empty beds of dried-up oceans and the peaks of mountains scattered over the surface. Dead volcanoes we believe these to be, but far larger and higher than any volcanoes that we have on our earth.

The moon is our nearest neighbor among all the heavenly bodies. It is called our satellite, because it revolves around the earth while the earth revolves around the sun.

Besides the planets, which, with their satellites or moons, revolve in regular order around the sun, there are those wonderful objects that we call comets. These also travel about the sun. Did you ever see a picture of a comet? It is like a star with a long, sweeping tail of light. The larger comets do not often visit us, but when they do come they make a




marvelous spectacle in the sky. Sometimes the tail is so long that it reaches one quarter of the way across the heavens.

These wonderful visitors to our skies move in regular orbits of their own. They come toward the sun from far away, turn around it, and then go off to a distance so great that we cannot follow them with the strongest telescope.

People used to be very much frightened at the sight of a comet. They did not understand its appearance, and were alarmed by it just as they were when the moon went between the sun and the earth and cut off the sun's light from the earth, causing an eclipse. These things frightened them because they did not form a part of the regular changes in nature that men had become accustomed to, and they did not understand what caused them. Although we do not know what the comets are or where they come from, our searchers after truth have found that they obey a law, as does everything else in the whole universe, and they have figured out the path that many of these comets follow.

For a longer time, however, men have known what makes an eclipse. When there is a full moon it sometimes happens that the earth gets so exactly between it and the sun that the shadow of the earth falls upon it. There is always a great shadow cast by the earth, but it is not often that there is anything for it to fall upon. So, when the moon gets in its way the circular shadow that the earth makes goes across the moon's face. Sometimes it only seems to take out a bite, but at other times it covers the moon's face entirely, and




we have a total eclipse of the moon. Those ancient people who used to be so alarmed had never thought of a shadow for the earth, it seems.

An eclipse of the sun happens when the moon, in revolving about the earth, goes directly between the sun and the earth, and when the sun is entirely covered by the moon it is called a total eclipse.

A total eclipse of the sun is an awesome event, and one that would alarm those earlier peoples who could not think what would cause it; but no one is alarmed now, because the reason of the eclipse is known. The men who study about the laws of God's universe can tell, long before it happens, just when an eclipse will come, even to the exact second; and they print all this in almanacs so we can know about it each year.

No one fears a thing when he knows that it is produced by a natural cause. We no longer dread the magnificent comets. Though they fill us with awe, as the marvelous works of God always must do, they fill us with no dread. Knowing about them takes away our fear. That is what Jesus meant when he said, "Ye shall know the truth and the truth shall make ye free."



LESSON 39

THE STARS

MEMORY VERSES

The heavens declare the glory of God:
And the firmament showeth His handiwork.
Day unto day uttereth speech,
And night unto night showeth knowledge.

Ps. 19: 1, 2

The voice that rolls the stars along
Speaks also unto thee.

Adapted from Isaac Watts

The Purpose

This lesson on the stars is given in the hope that the wonder of the stellar universe may touch the hearts of the children and live with them as a friendly interest all their lives. There is no reason why we should not have the same friendliness toward those constant companions of the night as did the Syrian shepherds of old. Such a friendliness developed in childhood will help to keep the heart in tune with the harmony of nature throughout life.

The special religious lesson is contained in the memory verses. After these lessons on the immensity and grandeur of space, it is well that the children should be reminded that God dwells also within their own hearts.

Suggestions for the Teacher

There are so many interesting and amazing facts about the stars, that it has been difficult to decide just which should be chosen for this necessarily short story,

but it is hoped that enough interest may be aroused to make the children want to learn more of the stars and constellations than can be described here. The teacher should urge this, encouraging the children to choose certain stars as they did trees, to watch and study and have for friends.

If it can be instilled into the minds of these growing children that the vastness of the universe only brings God nearer to them, none of these lessons will have been in vain.

A chart of the sky showing more of the constellations than are given in the handwork would give an added interest to the lesson. The stars which are in the summer sky are not so brilliant as those in the winter heavens, but the long warm evenings offer better conditions for their observation. The Big Dipper, Cassiopeia's Chair, and the Milky Way can all be seen at the season when this lesson is taught, and the chart on the leaflet will help the children to locate them.

OPENING TALK

Have you seen the moon during last month? Tell me how it looked, and show me what you have written about it on your leaflet. Have any of you remembered the names of the planets in our solar system? Let us see if we can name them all together, beginning with the one nearest the sun, and be sure not to leave out our earth! (Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, Neptune.)

You have learned something about the sun, the planets and their satellites, comets, and our own moon; now you shall hear the story of the stars.

THE STARS

ON bright, sunny days, as we look up and up into the deep blue sky, it seems as if we could see much farther than we can at night, when the darkness shuts in around us; yet in the depths of that blue sky there is no sign of a star. We know that stars are there, because when we look through a telescope or a long, narrow tube we can see them. Yet we do not see the stars by day, because the rays of the sun are so bright that they flood the sky with light. Only by cutting off the sun's rays by means of the long, narrow tube can the feebler light of the stars and planets reach our eyes. But just as soon as the sun has set and its light is beginning to fade away; from out the darkening sky the stars appear one by one.

Sometimes they seem very far away; sometimes, when the air is clear, as on the top of a high mountain, the stars seem very near, — just above the tree-tops. But they are, in truth, so many billion miles away that the mind cannot grasp the distance. It is of no use to try to tell you how long it would take an express train to reach one of those distant stars, for the number of years would be so great that it would not mean anything to you.

Many of the stars seem grouped in our sky as if they belonged together. But those stars are not

companions at all; they only seem so to us, because we see them from so great a distance. In reality there are vast spaces between them. They are not fixed stars, either, as the ancients believed them to be, and as we still call them. Each one is moving through space at an incredible speed, and so, they tell us, is our own sun.

Where are they going? No one knows. That is another of those secrets which in time the searchers after truth may discover and so be able to reveal to us more of God's universe. Yet we believe that they are not moving hither and thither without any law or order, because we have learned enough about God's universe to know that nothing is without law and order, be it a speck of dust or a stupendous sun. So we feel sure that these millions of suns are moving through space in some such regular order as that in which the planets and the comets in our solar system move.

In the vast space, without beginning and without end, which we call the universe there are millions and millions of suns, each revolving upon its own axis as our sun revolves, and each traveling in its own path. Around many of these suns, perhaps all, swing worlds or planets, each sun with its worlds forming a group in the vast space of the universe.

Shut your eyes and think of the sky at night when all the stars are shining. Can you see the sparkling stars looking as you saw them last night or the night before?

Can you imagine, too, our sun traveling along through space with its eight planets revolving about

it, and all their moons about them, with the comets coming from we know not whence, and after turning about the sun going back again to we know not where? If you can do this, you will have a picture of our solar system as the men we have called "the searchers of the sky" see it. They think of each star in the sky as the center of a system like ours, moving as our sun moves. Is it not a vast and wonderful universe in which we live?

There is one star, the light of which fades and then grows bright again. The Arabs long ago noticed this, and named the star Algol, or the demon, because it seemed to wink at them. Now our astronomers have found that that winking star is a great sun, having a dark companion which revolves around it, which cuts off part of its light from us. Is that dark companion a world, moving around the sun Algol? They think it is. So when Algol seems to wink we are really seeing an eclipse of a sun billions and billions of miles away.

Among the stars are many that are double; that is, instead of having a dark companion revolving around them, as our world revolves around the sun, two brilliant suns revolve around each other. What would we do in summer if we had two suns in the sky at once; or if one was in the sky by day and one by night? We should have no night then, only a short twilight twice a day; and how should we get any rest or sleep?

There is one of these star systems that to the naked eye looks like a single star, but when seen through a telescope it becomes three dazzling suns,—

one a beautiful blue, one a brilliant green and one a glowing yellow. With our eyes we could not live upon a world revolving around three such suns as those, could we? This world that we live upon with its single sun, shedding upon us its pure, white light, is much better for us, — indeed it is the only world for us, made as we are. To it God has adapted our bodies, and we could not live on a world that was quite different from this of ours.

Some stars shine with a clear, white light, like that of our sun, and those, they tell us, are all about the same age. Others shine with a steely blue light, and those are younger suns than ours, while others still are yellowish or a dull red. Those are older than our sun. Look at the stars on the next clear night and see if you can find one that shines with a reddish light, and one whose light is bluish, and others of which the light is pure white.

The brightest and the largest star is Sirius, or the Dog Star, which we can see only during the winter months. This star shines with a clear, white light, but it is such an enormous sun that the light it gives out is more than forty times as much as that shed by our sun. But Sirius is a younger sun than ours, and in the ages to come it will shrink and give less light and heat, for suns as well as planets shrink as they grow older.

Sirius is near Orion, the most brilliant constellation, or group of stars, in our winter sky. Try to get some one to point it out to you next winter, and to tell you the story the Greeks told about the great hunter Orion with his dog Sirius following him. In

winter, also, you will see a pretty little star cluster, called the Pleiades. About this constellation, too, the Greeks told a story of which you heard in the chapter about electricity; for these are the seven sisters of Phaëthon, those who wept the amber tears. The Greeks believed that the gods had such pity for the poor weeping sisters, that they changed them into stars. The Hebrews knew and loved these stars, and wrote about them. In the book of Job, a part of our Bible, written many centuries ago, are these lines:

Canst thou bind the cluster of the Pleiades,
Or loose the bands of Orion?

You need not wait for winter to see the Great Dipper. It is always in the northern sky, for it never sets. Sometimes it is upside down, and sometimes on one end or on the handle, but it is always there. The two bright stars of its front edge point directly toward the North Star, so we call them "the Pointers," because by them we can always find the North Star.

In the bend of the handle of the Dipper is a beautiful double star. Some persons have such strong eyesight that they can see that it is double without the aid of an opera glass. See if you can find the star, and whether it appears to you single or double.

You surely know that gleaming band of thickly clustered stars stretching across the sky; that you can always find. It is called the Milky Way. It is made up of multitudes of stars, so far away that we cannot see them separately. Their light blends

together, making what looks like a faint, milky pathway along the sky.

When we learn to know the brighter stars and the constellations, they become our friends as they have been the friends of so many of those who went before us. We call the stars by name, and pick out in the twinkling mass those that we like the best, knowing that ages and ages of men, women and children have looked upon the same stars and have regarded them in the same friendly way.

The winking Algol, the glorious Sirius, the red Arcturus and the bluish Vega have been named and watched by people for countless ages; so have Orion, the Pleiades, the Dipper, the Northern Crown, the Sickle, and all the other sparkling constellations.

And shall they not speak to us, those giant suns, rolling through endless space at the command of God? Let them say to us that the all-powerful God who made all things is yet our Father and Friend.

LESSON 40

THE TORCH BEARERS

MEMORY VERSE

For the invisible things of him since the creation of the world are clearly seen, being perceived through the things that are made, even his everlasting power and divinity.

Rom. 1: 20

The Purpose

The intent of this closing lesson is evident. The teacher will have little trouble in awakening the desire to pass on the torch of truth with its light undimmed. Let the story make its own appeal, keeping the impression of awe and reverence over this universe and its Creator to the end of the course.

Suggestions for the Teacher

A brief review which shall bring out the subjects of the four sections of this book and its general purpose may seem desirable at this point. If so, it must be carefully planned so that it may be interesting and not take up too much time from the last brief lesson period of the course. The work asked for on the leaflet makes such a review.

The poem printed on the leaflet should be read in class before the story is told.

The story of the torch bearers should, then, be given as the last thing in the lesson period. There will be no need to emphasize the thought of the responsibility of each child

to carry on the truth and let its light shine in the world. The story makes the point clear, and by its illustrations puts an ideal of life before the pupils.


The memory verse is used as a summary of the religious thought and aim of this course of lessons. Very exalted it is, both in thought and expression, but it will do the pupils good to reach up toward it now, and to store it in the memory, that later its full meaning may come to them.

OPENING TALK

We have talked together about the seeing eyes and the seeing mind. Tell me some of the things our eyes were to see in the sky, among growing things, among animals, among the rocks. Did we study anything that we cannot see? Electricity, yes; and that force to which Sir Isaac Newton gave a name — gravitation — and other forces in our universe. How did we learn to know these forces if we could not see them? It was through their effects, through the things we can see and touch.

Now we think when we come together here of the One whom none of us can ever see with these eyes of ours as we see each other. But there is a way in which we may see the invisible God. Our Bible verse tells us: "For the invisible things of Him since the creation of the world are clearly seen, being perceived through the things that are made, even His everlasting power and divinity." (Rom. 1: 20.)

The poem on our leaflet tells us the same thing — one of the loveliest of poems for a child to learn. Shall we read it now? Then we will have the story that tells us what we may do about the truth which has been discovered concerning our wonderful world and the dear God whose thought has created it all through the ages.



THE TORCH BEARERS

IN days gone by there used to be a religious festival in which the children took a part. They would run with lighted torches, each guarding his own torch most carefully as he ran, to keep it alight. It must have been a pretty sight to have seen those children, in their short, white garments, each lighting his torch from the one behind, and running forward to light that of the one in front; then, when all were lighted, to have seen them run on in a long line, eager to lay their still burning torches at the altar of the goddess in whose honor the festival was held.

No longer do children run in this festival of the torches; no longer do those peoples worship their gods and goddesses with fire, for they have become Christians who worship God "in spirit and in truth." But the idea of the lighted torch still remains, and is for us a symbol of the reaching upward of our hearts and of our thoughts.

Fire is a gift of God to our world. It is very useful, as we know, but it has for us a deep meaning, too. The family hearth where the ancients used to worship their household gods, and where the fire was never allowed to go out, has now come to mean to us the happy tie that binds a family together. So, too, the lighted torch has come down through the ages as a symbol of knowledge and wisdom.

Boys and girls are still torch bearers for the world. The sacred torch each carries is the light of truth and knowledge which the mind receives from those who know. You who have studied this book have lighted your torches from the burning thoughts of past ages. What people worked hard to discover you may now learn easily. And when you have learned and are eager to know more, your torch is ablaze.

Then you want both to keep your torch alight, and to give of its flame to others; for in this way the light of truth and wisdom is carried on through the ages. If the first man who learned how to make fire had kept the knowledge to himself and had not shown others how to make it too, the world would have been much longer in becoming civilized.

If the Phœnician merchants had not shown the Greeks and the Hebrews how to make an alphabet, we might not yet know how to read or write, nor how to record our thoughts in books. If the followers of Jesus had not gone out into the world, carrying the gospel of the truth he taught, we might never have heard his message nor wanted to live as he showed men how to live.


So throughout the ages, men, women, yes, and children too, have carried the torches on and on, each mind lighted by the thoughts of all who have gone before; and we, if we are faithful, must carry on the flame undimmed to light the torches of future generations.

Now this power of the mind and of the spirit with which God has endowed His children is the most marvelous thing in the whole world, — much more mar-

velous than steam or electricity, because it is able to discover all the forces and the materials upon the world, how to use them, and what laws govern them. The searchers after truth who discovered great laws of the universe, or who found the way to harness steam and electricity to do our daily work for us, are not the only ones whose torches have burned so brightly that they have kindled others. For little things count in this wonder world in which we live, and many a one has seen or done an apparently simple thing that has carried the world of men on to better ways of living.

The steam rising from the kettle of boiling water was of no significance to many people, but it meant something to young Watt, who saw that it could be successfully harnessed to do great work. The fine white grains of quartz sand upon the sea beach seem to most of us only a different form of the ground we walk upon; but some one found out how to make glass of them, and others learned to shape the glass into lenses for the telescopes, by means of which undreamed-of truths about other suns and worlds than ours have been found and proved.

There is a man living to-day who spends all his time trying to make our flowers and fruits and vegetables larger and of better quality. When Luther Burbank produces a new fruit, combining the delicious flavor of one with the larger size of another, is not this a benefit to mankind? He says that everyone can make the flowers more beautiful if they will watch the bees and work as they do. He himself is showing us how. When he discovers a way to make



the spiny, useless desert cactus grow without spines, so that it can be used as nourishing food, does he not keep his torch burning brightly, and pass on its light to others?


Oh! there are so many, many ways to help the world; so many, many ways to bless mankind; so many, many ways to learn God's laws.

We must hold our torches high and guard the flames carefully. The shame would be far greater for us should our torches go out, than it was for those children who carried real ones. They were obliged as they ran to guard the flames against the wind, and to watch most carefully lest the light should blow out.

If the flame of the torch we carry dies down and goes out, it is because we neglect it. The fire is ours, and God, the giver, watches over us to aid us in our endeavor to lift high the torch of true knowledge and wisdom.

By its light we enter into the mystery and the marvel of this world in which we live. By its light we learn to "think God's thoughts after him," as Kepler said when he studied the stars. By its light we find the true pathway of life. We may, if we are faithful, be of those who carry on, undimmed, this torch of truth, so that its light shines steadily and grows brighter through the years, to light the lives of all who live in God's wonder world.

THE END





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